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12051/P

CHOLERA,

BY

ASSISTANT SURGEON EDWARD JAMES [illegible]

OF THE BENGAL ARMY.

82094

STATISTICS

OF

CHOLERA,

BY

ASSISTANT SURGEON EDWARD BALFOUR,

OF THE MADRAS ARMY,

IN CHARGE OF THE RIGHT HONORABLE THE GOVERNOR'S BODY GUARD.

MADRAS:

PRINTED AND PUBLISHED BY MESSRS. PHAROAH AND CO.

ATHENÆUM PRESS—MOUNT ROAD.

1849.

PREFACE.

THE data accumulated during the thirty years that have elapsed since epidemic cholera first made its appearance seeming to me sufficiently abundant to repay an enquiry into the mode in which this disease developes itself, and the interval of time being sufficiently long to allow of fair averages being struck, I have entered upon the investigation of the subject; and though some of the results obtained may surprise others as much as they did myself, I trust, that a perusal of the tables will show, that every care has been taken to ensure their accuracy, and that the deductions are fully warranted by the facts adduced.

This brochure, framed with the object of collecting all that is known concerning cholera, is offered as a contribution to vital statistics; and the investigation being as yet very imperfect, particularly as regards the origin and treatment of the disease, I hope that the data here furnished may prove useful to some of the numerous enquirers now in the field, by suggesting new subjects of enquiry, and new modes of conducting it, and thus lead, perhaps, to the explanation of many hitherto unaccountable peculiarities of the malady. I have also great hopes that the enquiry (alluded to in the appendix) now in progress in the Madras presidency, may prove of great value in this respect, and trust ere long to be able to communicate the results of it.

It will be seen, on perusal of the following pages, that medicinal treatment is proved to be of decided value in this disease, but I have but slightly dwelt on that point, my own views leading me rather to enquire into the means of preventing sickness, than

those of curing it. I allow it to be a beautiful idea that the Supreme Being, in permitting his creatures to be afflicted with pestilences, has also in his mercy provided remedies for their cure, and those who entirely adopt this belief will doubtless continue to search exclusively for means of removing this and other maladies; but, without in any way wishing to damp the energy of such enquirers, I think all medical men will allow the superiority of prophylactic over mere curative measures, and admit that those who regard disease as the consequence of an infraction of the physical laws decreed for our guidance, and consider it as a warning to observe these laws more strictly for the future, take a no less elevated view of their duties; for we thereby open to ourselves a vast field for the exercise of benevolence in discovering the source of disease and the means of preventing it; whilst, if we take the former view, we may look on with apathy till sickness break forth, and though we may then exert all our energies and employ all the means furnished by art and science to subdue it, the following pages will too clearly show, that in combatting with cholera, at least, we shall meet with but little success.

I have given below* a list of the sources from which the information contained in the following pages is derived; I have great pleasure in stating that all my brother officers in the Madras pre-

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* Statistical Reports on the Sickness, Mortality and Invaliding of H. M. Troops. Vols: 1838; 1839; 1840 and 1841.
Statistical Reports on the Health of the Navy. Vols: 1840, 1841.
Reports on the Medical Topography of the Madras Army. Vols: 1842, 1843, 1843, 1844 and 1844.
Johnson and Martin on Tropical Climates. Edition 1841.
Dr. Lorimer's Report on cholera. 1846.
Records of the Madras Medical Board Office.
Records of the Office of Superintending Surgeon, Ceded Districts.
Surgeon James Macgregor (H. M. K. O. Borderers) in Madras Medical Journal.
Parliamentary Return, 17th February 1847.
Dr. Forry's Report on the United States Army.

sidency have evinced the greatest willingness to assist me, by furnishing me with extracts from the records of their departments, and I beg to offer to the Members of the Medical Board, Surgeon George Pearse, and Assistant Surgeon Lorimer, my best thanks for their kindness.

I regret that I have been unable to add to the tables herein given, any particulars concerning the Bengal and Bombay armies, having, as yet, received no answer from the authorities, there, to my applications for information.

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STATISTICS OF CHOLERA.

EPIDEMIC Cholera is the only disease separately enumerated in the Parliamentary Returns which were lately obtained from the three Presidencies of India. Since the early part of 1817 when this disease made its appearance, (in the form that it now assumes,) in the eastern part of Bengal, it has visited nearly all the countries north of the equator; in most of these countries, however, although its ravages extended over all the population, it only remained a year or two and then disappeared; but, in India, it has continued to recur, sometimes generally, and occasionally to a limited extent, but still to recur year after year in one part or another of the country, and in the period embraced in the parliamentary returns, it caused nearly the eighth part of all the mortality of the European soldiers in India, while, of the deaths amongst native soldiers, nearly a fifth part arose from this singular disease. Out of 13,012 deaths of the H. E. I. Company's European soldiers in India, in the 20 years from 1825 to 1844, the deaths from cholera amounted to 1,741; and amongst their native soldiers, of 69,973 deaths, this disease alone occasioned a loss of 13,260, nearly a fifth part of the whole.

In some seasons this disease has appeared only in sporadic cases; in other years it has broken out in an epidemic form, but it has visited each presidency every year, and while, in some stations, it has scarcely ever been absent from the crowded bazaars, in other places its occurrence has been almost unknown.

TABLE I.—Showing the total deaths of the E. I. Co.'s European and Native Soldiers, and the Ratio per 1000 of their strength that died from Cholera in each of the three Presidencies, in the twenty years from 1825 to 1844. Vide Parliamentary Paper, 17th February, 1847.

Years.	EUROPEAN SOLDIERS.						Years.	NATIVE SOLDIERS.					
	BENGAL.		MADRAS.		BOMBAY.			BENGAL.		MADRAS.		BOMBAY.	
	Total Deaths by Cholera.	Annual Ratio per 1000 died.	Total Deaths by Cholera.	Annual Ratio per 1000 died.	Total Deaths by Cholera.	Annual Ratio per 1000 died.		Total Deaths by Cholera.	Annual Ratio per 1000 died.	Total Deathsby Cholera.	Annual Ratio per 1000 died.	Total Deathsby Cholera.	Annual Ratio per 1000 died.
1825	25	5·5	60	13·7	1	0·5	1825	216	1·4	792	12.7	237	5·8
1826	23	5·2	11	2·4	20	11·5	1826	189	1·2	294	4.0	183	4·6
1827	34	8·9	6	1·2	5	2·6	1827	137	1·0	283	4.0	33	0·8
1828	26	6·2	13	2·4	13	5·8	1828	199	1·6	368	5.7	85	2·5
1829	29	6·4	3	0·5	1	0·4	1829	156	1·4	213	3.5	21	0·6
1830	42	9·2	32	6·0	2	0·7	1830	236	2·5	126	2.2	112	3·6
1831	38	7·8	41	7·6	4	1·7	1831	181	2·1	271	5.3	46	1·4
1832	47	10·8	39	7·7	13	5·3	1832	232	2·9	333	5.6	63	2·1
1833	51	12·0	48	10·1	8	3·5	1833	259	3·2	579	11.6	116	4·4
1834	63	16·5	2	0·4	2	0·9	1834	242	3·0	58	1.1	96	3·5
1835	48	11·7	1	0·2	0	0	1835	217	2·7	2	0.04	28	0·9
1836	43	10·1	1	0·2	1	0·5	1836	223	2·7	27	0.5	2	0·0
1837	39	9·0	19	4·0	12	6·4	1837	189	2·3	351	7.2	113	4·0
1838	75	17·4	7	1·4	7	3·0	1838	187	2·2	502	10.2	12	0·4
1839	65	15·8	27	5·7	31	15·1	1839	249	2·6	249	4.8	148	5·1
1840	51	10·7	26	5·1	24	10·1	1840	136	1·3	122	2.0	131	4·8
1841	81	17·0	5	0·8	4	1·1	1841	291	2·7	241	3.7	24	0·7
1842	47	9·8	41	6·7	90	19·1	1842	259	2·2	741	11.6	158	5·9
1843	107	21·3	13	2·1	2	0·3	1843	361	3·1	905	13.8	109	3·4
1844	87	17·2	37	6·2	48	13·0	1844	329	2·7	519	8.0	79	1·5
Total 20 yrs.	1021	11·554	432	4·268	288	5·648	Total 20 years.	4488	2·19	6976	6·03	1796	2·81

European Soldiers are more frequently attacked with Cholera than Native Soldiers.

From this table it would appear that cholera has carried off a greater proportion of the strength of the european soldiers, than of the native army, and it is a curious matter to observe that while the europeans in the Bengal army have suffered from it most of all the presidencies, the natives of that army have suffered the least, a circumstance which will be observed by placing the totals of the columns together.

Table II.	European Soldiers.		Native Soldiers.	
Presidencies.	Total Deaths from Cholera in 20 years.	Average Annual Ratio per 1000 of mean strength died in the 20 years	Total Deaths from Cholera in 20 years.	Average Annual Ratio per 1000 of mean strength died in the 20 years
Bengal....	1,021	11·554	4,488	2·19
Madras....	432	4·268	6,976	6·03
Bombay....	288	5·648	1,796	2·81

The returns, however, afford no means of ascertaining the cause of the difference in the rate of mortality from cholera, of the european and native soldiers, and as the cantonments, in which the bulk of the two classes of troops are distributed, are often, even when in the same command, many hundred miles apart, doubts might arise as to whether the greater number of deaths among the Europeans had been caused by their being located in stations where cholera was more frequent, or whether it had occurred from their being more susceptible to the disease,—but the following table which has been obtained from the Reports on the Madras Army, and from Dr. Macgregor's papers in the Madras Journal, will throw some light on this point.

TABLE III showing the Average annual ratio per 1,000 of mean strength, of the European and native soldiers in the same cantonments admitted for cholera.

	Aggregate Strength.	TOTAL. Admissions from Cholera.	TOTAL. Deaths by Cholera.	Average Annual Ratio per 1,000 of mean strength admitted by Cholera.
Kamptee, Europeans of all Arms, 10 years from 1829 to 1838...	9,574	153	39	15.98
Kamptee, Natives of all Arms, 10 years from 1829 to 1838.	49,313	148	87	3.00
St. Thomas' Mount, European Horse Artillery, 9 yrs. from 1829 to 1838 exclusive of 1831	1,721	23	5	13.36
St. Thomas' Mount, European Foot Artillery 10 yrs. from 1829 to 1838..	5,182	13	3	2.50
St. Thomas' Mount, Native Foot Artillery, 9 yrs. from 1829 to 1838 exclusive of 32.	4,417	17	5	3.84
Bellary, inside the fort, European Artillery, 13 yrs. from 1827 to 1839..	1,478	44	16	29.7
Bellary, outside the fort, Native Infantry, ½ mile distant, 13 yrs. from 1827 to 1839.	33,283	302	143	9.0
* Madras, Europeans, within Fort St. George, for 10 yrs. from 1829 to 1838	13,981	392	136	28·03
Madras, Natives, without Fort St. George, for 10 yrs. from 1829 to 1838.	60,142	263	140	4·37

From the different proportions in which it has attacked the two classes of troops in these four cantonments it would appear to be owing to a greater susceptibility in the european

* There probably are a few soldiers of this garrison who do not reside inside the Fort, but their numbers are too small to affect the results. In the 7 years from 1832 to 1838 the average annual ratio per 1,000 of mean strength of H. M. Regts. attacked, inside of Fort St. George, with Cholera, was 27·37.

constitution that the rate of mortality per 1,000, has been so much higher among them than in the native army. In Kamptee 15·9 per 1,000 of the european soldiers were admitted, but only 3·0 per 1,000 of their native comrades, and in the town and fort of Madras this greater liability has been very marked, 28·0 per 1,000 of the europeans having been attacked inside the fort, while of the native soldiers, about a mile distant, at Perambore, Black Town and Vepery, only 4·3 per 1,000 have been seized with it.

A visitation of Epidemic Cholera increases the mortality of the year in which it occurs above that of other years.

There is an opinion prevalent amongst unprofessional men in India, as well as in our own country, that a visitation of epidemic cholera does not increase the rate of mortality above the average of a series of years, and it has been stated, as the reason for forming such an opinion, that when cholera prevails other diseases are in abeyance. These returns enable us to test the accuracy of this statement, and they show that in the Bengal and Bombay presidencies, in the greater number of those years, that the proportion of deaths from ordinary diseases was above the average of the period from 1825 to 1844, the ratio of mortality from cholera was, also, higher, and in the majority of the years that cholera deaths were more than the average rate, the deaths from ordinary diseases were so likewise; but the same returns likewise show that there has been no such correspondence in the Madras Presidency, for, in it, in the greater number of the years when the proportion of the deaths from cholera was more than the average, there was no increase in the deaths from ordinary diseases, nor was the proportion of deaths from cholera, generally, greater in years when the mortality from ordinary diseases was above the average rate. These points can be observed from the following Table—

IV.
EUROPEANS.

TABLE showing the Ratio per 1,000 of mean strength that Died from ordinary diseases during the years that the Ratio of deaths from Cholera was above the average of the 20 years.

Bengal.			Madras.			Bombay.		
Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.
1833	12.0	64.4	1825	13.7	104.5	1826	11.5	103.6
1834	16.5	74.8	1830	6.0	26.5	1828	5.8	66.0
1835	11.7	66.1	1831	7.6	37.1	1837	6.4	54.2
1838	17.4	65.3	1832	7.7	28.0	1839	15.1	65.5
1839	15.8	61.9	1833	10.1	35.2	1840	10.1	53.9
1841	17.0	60.4	1839	5.7	21.7	1842	19.1	35.0
1843	21.3	59.4	1840	5.1	27.5	1844	13.0	53.0
1844	17.2	57.6	1842	6.7	26.3			
			1844	6.2	19.7			
Average	16.3	63.3	Average	7.5	34.8	Average	12.79	56.43

TABLE showing the Ratio per 1,000 of mean strength that died from Cholera during the years that the Ratio of deaths from ordinary diseases was above the average of the 20 years.

Bengal.			Madras.			Bombay.		
Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.
1825	5.5	119.4	1825	13.7	104.5	1825	0.5	45.6
1827	8.9	76.6	1826	2.4	70.5	1826	11.5	103.6
1833	12.0	64.4	1827	1.2	51.5	1827	2.6	70.7
1834	16.5	74.8	1828	2.4	43.9	1828	5.8	66.0
1835	11.7	66.1	1831	7.6	37.1	1829	0.4	47.3
1838	17.4	65.3	1833	10.1	35.2	1835	0.0	46.2
1842	9.3	62.3	1834	0.4	35.2	1837	6.4	54.2
						1839	15.1	65.5
						1840	10.1	53.9
						1843	0.3	53.7
						1844	13.0	53.4
Average	11.6	75.8	Average	5.3	53.0	Average	5.82	58·45

V.
NATIVES.

TABLE showing the Ratio per 1,000 of mean strength that died from ordinary diseases during the years that theRatio of deaths from Cholera was above the average of the 20 years.

BENGAL.			MADRAS.			BOMBAY.		
Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.
1830	2.5	17.8	1825	12.7	30.6	1825	5.820	11.910
1832	2.9	16.6	1833	11.6	15.6	1826	4.640	13.390
1833	3.2	20.5	1837	7.2	14.3	1830	3.610	10.930
1834	3.0	23.8	1838	10.2	14.5	1833	4.490	5.510
1835	2.7	15.7	1842	11.6	18.0	1834	3.590	4.670
1836	2.7	17.8	1843	13.8	12.9	1837	4.00	8.000
1837	2.3	11.7	1844	8.0	14.5	1838	4.770	10.550
1838	2.2	20.3				1839	5.16	18.690
1839	2.6	20.0				1840	4.95	12.96
1841	2.7	13.3				1842	5.98	11.43
1842	2.2	16.7				1843	3.42	3.49
1843	3.1	13.7						
1844	2.7	11.7						
Average	2.7	16.6	Average	10.9	17.4	Average	4.5	10.3

TABLE showing the Ratio per 1,000 of mean strength that died fromCholera during the years that the Ratio of deaths from ordinary diseases was above the average of the 20 years.

BENGAL.			MADRAS.			BOMBAY.		
Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.	Years.	Cholera.	Ordinary diseases.
1825	1.4	17.3	1825	12.7	30.6	1825	5.82	11.91
1830	2.5	17.8	1826	4.1	25.1	1826	4.64	13.39
1831	2.1	18.3	1834	1.1	19.5	1827	0.84	12.18
1832	2.9	16.6	1836	0.5	24.7	1830	3.61	10.93
1833	3.2	20.5	1842	11.6	18.0	1838	4.77	10.55
1834	3.0	23.8				1839	5.16	18.69
1835	2.7	15.7				1840	4.95	12.96
1836	2.7	17.8				1841	0.78	12.16
1838	2.2	20.3				1842	5.98	11.43
1839	2.6	20.0				1844	1.58	11.93
1842	2.2	16.7						
Average	2.4	18.5	Average	6.4	23.7	Average	3.3	12.6

It would appear from these Tables, that when the ratio of mortality from cholera was above the average of the 20 years,

Amongst the Europeans,
- There were 4 years out of 8 that the rate from ordinary diseases, likewise, was in excess in Bengal.
- There were 3 years out of 9 that the rate from ordinary diseases, likewise, was in excess in Madras.
- There were 6 years out of 7 that the rate from ordinary diseases, likewise, was in excess in Bombay.

being a total of 13 years out of 24 in the three presidencies.

Amongst the Natives,
- There were 9 years out of 13 that the rate from ordinary diseases, likewise, was in excess in Bengal.
- There were 2 years out of 5 that the rate from ordinary diseases, likewise, was in excess in Madras.
- There were 6 years out of 10 that the rate from ordinary diseases, likewise, was in excess in Bombay.

being a total of 17 years out of 28 in the three presidencies.

And when the rate of mortality from ordinary diseases was above the average of the 20 years.

Amongst the Europeans,
- There were 4 years out of 7 that the rate from cholera, likewise, was in excess in Bengal.
- There were 3 years out of 7 that the rate from cholera, likewise, was in excess in Madras.
- There were 6 years out of 11 that the rate from cholera, likewise, was in excess in Bombay.

being a total of 13 years out of 25 in the three presidencies.

Amongst the Natives,
- There were 9 years out of 11 that the rate from cholera, likewise, was in excess in Bengal.
- There were 2 years out of 5 that the rate from cholera, likewise, was in excess in Madras.
- There were 7 years out of 10 that the rate from cholera, likewise, was in excess in Bombay.

being a total of 18 years out of 26 in the three presidencies.

It will be observed from the above that in the Bengal and Bombay armies an unusual prevalence of cholera has been occasionally attended with a greater mortality from other diseases, while the mortality from cholera and other diseases among the europeans and natives of the Madras army have rarely been thus associated; although in the series of years the average rate of mortality has been greater in all the Presidencies. This will be observed by the following numerical statement taken from the preceding Tables to allow a more ready reference.

TABLE VI.—Showing the average annual Ratio per 1,000 of mean strength that Died.

Average annual ratio per 1,000 of mean strength died,	OF EUROPEANS.									OF NATIVES.								
	BENGAL.			MADRAS.			BOMBAY.			BENGAL.			MADRAS.			BOMBAY.		
	Cholera.	Ordinary Diseases.	Total.	Cholera.	Ordinary Diseases.	Total.	Cholera.	Ordinary Diseases.	Total.	Cholera.	Ordinary Diseases.	Total.	Cholera.	Ordinary Diseases.	Total.	Cholera.	Ordinary Diseases.	Total.
In the 20 years from 1825 to 1844	11·5	62.3	73·8	4·2	34·3	38·4	5·6	45·1	50·7	2·1	15·7	17·9	6·0	15·6	21·6	2·8	10·1	12·9
During the years when the ratio of deaths from ordinary diseases was above the average of the 20 years.....	11·6	75·8	87·4	5·3	53·0	58·4	5·8	58·4	64·2	2·4	18·5	20·9	6·4	23·7	30·2	3·3	12·6	15·9
During the years when the ratio of deaths from cholera was above the average of the 20 years.	16·3	63·3	79·6	7.5	34·8	42·4	12·79	56·4	69·1	2·7	16·6	19·3	10·9	17·4	28·3	4·5	10·3	14·9

It may be observed from the previous table that in the average of the series of years when cholera deaths were in excess, the mortality from all other diseases was somewhat increased above the average of the 20 years; both among the europeans and natives in all the three presidencies.

What are the admissions from all "diseases" during years when the ratio of deaths from cholera is above the average?

The following table will enable an opinion to be formed as to the frequency of admissions into hospital in the years that the ratio of deaths from cholera has been greater than in the period under review.

TABLE VII.—Showing the ratio per 1,000 of mean strength admitted into hospital from all diseases in the three presidencies during the years that the ratio of deaths from cholera was above the average of the 20 years.

EUROPEANS.								NATIVES.							
BENGAL.			MADRAS.			BOMBAY.		BENGAL.			MADRAS.			BOMBAY.	
Years.	Total admissions from all diseases.	Ratio per 1,000 of mean strength admitted.	Years.	Total admissions from all diseases.	Ratio per 1,000 of mean strength admitted.	Years.	Total admissions from all diseases.	Ratio per 1,000 of mean strength admitted.	Years.	Total admissions from all diseases.	Ratio per 1,000 of mean strength admitted.	Years.	Total admissions from all diseases.	Ratio per 1,000 of mean strength admitted.	Years.	Total admissions from all diseases.	Ratio per 1,000 of mean strength admitted.
1833	6979	1653·7	1825	7842	1802·	1826	4764	2758·	1830	47,138	503·	1825	73,273	1182·	1825	39,041	958·
1834	8738	2295·8	1830	6300	1196·	1828	6178	2774·	1832	46,622	591·	1833	35,915	720·	1826	37,161	942·
1835	7589	1858·2	1831	5786	1086·	1837	5530	2971·	1833	38,183	479·	1837	36,793	757·	1830	28,537	980·
1838	8514	1978·6	1832	5234	1042·	1839	3157	1545·	1834	63,805	807·	1838	37,490	766·	1833	20,652	801·
1839	6449	1573·6	1833	7288	1537·	1840	3606	1518·	1835	53,584	677·	1842	53,170	833·	1834	24,350	910·
1841	11202	2357·8	1839	5332	1135·	1842	2039	433·2	1836	34,116	426·	1843	47,508	727·	1837	21,838	773·
1843	9339	1861·8	1840	7590	1504·	1844	6266	1708·	1837	39,626	490·	1844	48,599	753·	1838	22,675	866·
1844	8929	1773·8	1842	8099	1331·				1838	46,354	559·				1839	30,104	1049·
			1844	5744	976·				1839	42,632	451·				1840	29,956	1131·
									1841	73,636	696·				1842	30,465	1151·
									1843	98,936	876·				1843	28,550	896·
									1842	95,323	830·						
									1843	91,751	757·						
									1844								
8 years	67,739	1918·2	9 years	59,215	1276·4	8 years	31,540	1695·2	13 years	771,706	641·6	7 years	332,748	826·7	11 years	313,329	946·
Average Annual Ratio per 1,000 in the 20 years.		1857			1341·			1724·			537·			782·			917·

It is possible that the existing opinion, alluded to at page 5, that a visitation of cholera in an epidemic form does not increase the mortality of the year above the average of a period, may have been entertained from drawing general conclusions from the number of admissions in some particular country. As it will be observed from the preceding table that, on the average of the years when cholera was more than usually prevalent, the ratio of admissions from all diseases among the europeans in the Madras and Bombay presidencies, has been even lower than the average of the 20 years; and even in the Bengal presidency, the average annual proportion of admissions was very triflingly increased.

Is disease generally more prevalent when cholera appears?

Colonel Tulloch, at page 52 of the Ceylon Report, notices a feature in cholera, that of making its appearance at the otherwise unhealthy periods of the year. Cholera, has generally occurred, as an epidemic in that colony in the months of April and May, or again in November and December, and he remarks that "the outbreaks of remittent fever and cholera in these months have only been in accordance with the usual law of epidemics which generally make their appearance at those seasons of the year which are otherwise the most unhealthy." If disease generally be alluded to, here, this feature is not observable as a characteristic of cholera as it occurs in the Madras presidency, where, whether the year be examined in half yearly or quarterly periods, cholera seems often to have been more frequent when diseases generally were less so.

The Madras Reports show that in the 10 years from 1829 to 1838, cholera occurred among the Madras troops as follows;

TABLE VIII.

EUROPEANS. AGGREGATE STRENGTH 103,431.								NATIVES. AGGREGATE STRENGTH 568,403.							
1ST HALF YEAR.				2D HALF YEAR.				1ST HALF YEAR.				2D HALF YEAR.			
Total admitted by		Ratio per 1,000 of mean strength admitted by		Total admitted by		Ratio per 1,000 of mean strength admitted by		Total admitted by		Ratio per 1,000 of mean strength admitted by		Total admitted by		Ratio per 1,000 of mean strength admitted by	
Cholera.	All other diseases.	Cholera.	All other diseases.	Cholera.	All other diseases.	Cholera.	All other diseases.	Cholera.	All other diseases.	Cholera.	All other diseases.	Cholera.	All other diseases.	Cholera.	All other diseases.
1757	87,142	16·9	841·	1076	96,890	10·4	936·	3255	169,627	5·7	298·	2091	172,354	3·6	303.

TABLE IX.—Showing the ratio per 1,000 of mean strength of H. M. Regiments, serving in the Madras presidency, admitted by cholera and admitted by all diseases in the 4 quarters of the years.

STATIONS. PERIOD.	Average ratio per 1,000 of admissions by Cholera.					Average ratio per 1,000 of mean strength admitted from all diseases.				
	1st Quarter.	2nd Quarter	3rd Quarter.	4th Quarter.	Average of the year.	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Average of the year.
Bangalore,.....for 18 years, from 1826 to 1843 inclusive	1.5	12.5	1.4	1.4	17.4	386.2	455.6	400.3	377.6	1023.9
Moulmein,.....for 17 years, from 1827 to 1843	2.1	2.9	0.3	0.06	5.3	333.3	443.4	383.5	406.6	1572.6
Arnee,.....for 7 years, from 1828 to 1830; 1835 to 1836; 1838, and from October 1842 to February 1843	40.3	2.1	1.5	2.6	48.6	404.3	358.3	370.1	404.7	1546.1
Fort St. George, for 18 years, from 1826 to 1843....	2.8	2.0	7.7	5.6	18.7	374.7	508.2	495.9	512.3	1905.2
Bellary,... ....for 18 years, from 1826 to 1843.....	6.7	23.0	2.5	13.8	47.0	490.3	576.7	528.9	593.1	2192.0
Belgaum,.....for 6 years, from 1827 to 1828, and from January 1839 to October 1842....	0.0	0.0	0.0	0.27	0.1	543.0	559.4	428.0	528.7	3057.6
Secunderabad,... for 16 years, from 1826 to 1840 and from February to December 1843.....	1.1	1.5	1.2	0.0	3.9	573.6	513.6	535.2	572.0	2191.6
Trichinopoly,....for 18 years, from 1826 to 1843....	9.1	1 6	1.2	2.1	13.9	422.4	486.9	485.0	482.5	1878.1
Kamptee,.....for 2 years, for 1840 and from February to December 1843.....	0.8	0.3	0.4	1.9	3.6	406.9	556.7	615.3	557.7	2168.5
Cannanore,.....for 18 years, from 1826 to 1843..... ..	0.2	0.08	1.8	0.2	2.4	415.2	382.3	419.2	460.2	1661.2
Arcot,.....for 8 years, from July 1826 to March 1828, and from September 1842 to February 1843.. ..	1.8	6.8	3.1	58.9	93.4	754.5	513.6	510.7	696.7	2438.1

And the Quarterly Reports of Dr. Nicholson's Tables demonstrate the same result.

In two out of eleven stations in the Madras presidency, viz. in Bangalore and Moulmein, the greatest proportion of admissions from cholera and from all diseases, occurred in the same quarter of the year, and in Arnee the two quarters preceding the great cholera quarter were very unhealthy; but in the remaining eight stations there has been no coincidence.

Are particular classes of diseases more frequent at the time when cholera appears?

Colonel Tulloch's remark regarding cholera making its appearance at the unhealthy periods of the year is, however, probably in allusion to other of the severer diseases. Indeed many eminent men have maintained that cholera, rheumatism, dysentery and fever, &c. are modifications of disease, or at least that these all arise from the same cause; and when Dr. Nicholson's tables are examined to ascertain the prevalence of other severe diseases, while cholera is present, there is a degree of connexion observable as to the seasons of the year at which they occur.

Amongst the european soldiers in the Madras cantonments, for instance, as will be observed from the following table, an unusual prevalence of cholera has, in nine stations out of eleven, had, in the quarter preceding, accompanying or following the out-break, a greater than the average quarterly proportion of fevers, liver disease, dysentery and diarrhœa.

TABLE X.—Shewing the Average Annual Ratio per 1,000 of Mean Strength admitted in the

Stations.	Diseases.	Quarter.				Total of the year.
		1st.	2nd.	3rd.	4th.	
Arcot	Cholera	1.8	6.8	3.1	58.9	93.4
	Fevers	61.3	131.4	57.3	78.1	302.1
	Liver disease	74.0	61.4	35.9	47.0	193.5
	Dysentery	106.5	56.3	54.7	109.9	325.7
	Diarrhœa	1.8	1.7	19.5	39.7	87.8
	Rheumatism	28.9	30.7	20.1	23.8	96.3
Arnee	Cholera	40.3	2.1	1.5	2.6	48.6
	Fevers	44.8	63.1	44.3	75.0	237.9
	Liver disease	27.2	25.1	22.1	19.6	94.2
	Dysentery	44.3	48.3	52.7	55.5	200.4
	Diarrhœa	23.2	24.0	20.1	30.5	101.4
	Rheumatism	23.7	14.2	10.0	22.3	74.7
Bellary	Cholera	6.7	23.9	2.5	13.8	47.0
	Fevers	124.9	176.6	81.9	160 4	545.8
	Liver disease	25.4	24.3	30.4	23.9	104.2
	Dysentery	31.5	33.2	46.0	56.4	166.4
	Diarrhœa	12.3	27.3	21.7	26.0	88.1
	Rheumatism	29.9	31.6	38.5	30.4	130.8
Fort St. George	Cholera	2.8	2.0	7.7	5.6	18.7
	Fevers	62.9	126.0	88.5	99.8	380.6
	Liver disease	20.3	27.7	26.3	22.2	96.9
	Dysentery	50.8	53.5	68.2	76.5	251.5
	Diarrhœa	21.2	26.1	33.0	37.0	119.0
	Rheumatism	23.9	30.0	25.8	25.7	105.6
Bangalore	Cholera	1.5	12.5	1.4	1.4	17.4
	Fevers	42.3	52.0	42.4	40.4	177.7
	Liver disease	24.4	30.4	25.7	23.6	104.6
	Dysentery	24.1	47.0	39 0	25.5	137.6
	Diarrhœa	5.2	20.2	7.2	51.5	38.9
	Rheumatism	17.0	18.2	18.8	17.4	71.6

Stations.	Diseases.	Quarter.				Total of the year.
		1st.	2nd.	3rd.	4th.	
Trichinopoly.	Cholera	9.1	1.6	1.2	2.1	13.9
	Fevers	74.5	92.4	98.6	107.1	372.1
	Liver disease	20.4	24.6	25.8	19.6	90.9
	Dysentery	37.5	48.6	47.9	46.2	180.6
	Diarrhœa	17.2	21.6	15.6	15 9	70.4
	Rheumatism	20.2	15.9	19.8	23.0	78.9
Moulmein	Cholera	2.1	2.9	0.3	0.06	5.3
	Fevers	76.8	113.4	93.8	80.8	365.8
	Liver disease	19.1	24.5	20.6	16.9	81.3
	Dysentery	25.6	52.2	54.1	38 9	171.8
	Diarrhœa	19.0	45.8	27.2	31.7	124.5
	Rheumatism	18.2	17.2	20.7	16.5	72.8
Secunderabad	Cholera	1.1	1.5	1.2	0.0	3.9
	Fevers	362.3	143.5	154.2	227.0	684.1
	Liver disease	43.2	38.8	39.5	39.9	161.5
	Dysentery	69.2	55.1	89.8	78.7	291.3
	Diarrhœa	19.4	23.5	31.9	25.0	100.1
	Rheumatism	23.6	20.8	22.4	20.8	87.7
Kamptee	Cholera	0.8	0.3	0.4	1.9	3.6
	Fevers	86.5	238.5	263.3	251.4	852.1
	Liver disease	14.2	17.0	16.9	12.0	60.1
	Dysentery	20.2	20.2	54.7	27.4	123.5
	Diarrhœa	24.9	32.1	31.9	18.8	107.5
	Rheumatism	34.4	23.4	37.5	31.1	122.3
Belgaum	Cholera	0.0	0.0	0.0	0.27	0.1
	Fevers	66.6	63.5	44.6	91.03	369.3
	Liver disease	41.6	37.03	32.6	26.3	135.8
	Dysentery	53.1	75.3	60.1	67.1	256.7
	Diarrhœa	27.4	37.3	16.1	46.9	130.1
	Rheumatism	43.3	49.1	44.6	44.1	181.1
Cannanore	Cholera	0.2	0.08	1.8	0.2	2.4
	Fevers	50.6	50.5	49.3	54.2	204.7
	Liver disease	26.4	26.4	23 3	23.9	100.1
	Dysentery	62.3	73.7	84.3	72.9	293.0
	Diarrhœa	13.9	20.6	13.8	13.0	61.5
	Rheumatism	16.4	22.7	21.5	17.8	78.4

In five cantonments, the great cholera quarters of the year were preceded by the quarters of greatest fever; in four cantonments, the greatest fever quarters and greatest cholera quarters were coincident; and, only in two cantonments, there was no apparent correspondence. In four cantonments, the quarter of greatest rate of liver disease preceded the greatest cholera quarter; in three cantonments, the highest rates of liver disease and of cholera were coincident; in three cantonments, the quarter of greatest rate of liver disease followed that of cholera, and only in one cantonment no coincidence is observable; and, pursuing this subject, we observe that in 10 stations out of 11, the quarters of the year in which most cholera occurred were either immediately preceded, accompanied, or immediately followed by the quarters in which the greatest rate of dysentery and diarrhœa occurred. Among the european soldiers in the madras presidency, then, it would seem that there is a certain connexion, as regards season of the year, in the occurrence of the severer classes of diseases, viz. fever, liver disease, dysentery, diarrhœa, and cholera.

The valuable cholera report on the madras native army, by Assistant Surgeon Lorimer, furnishes the ratio per 1,000 of their mean strength admitted and died from cholera, fevers, dysentery and diarrhœa, and other diseases, and the following table has been arranged from his report to assist in determining if fevers and bowel complaints be more frequent amongst native soldiers in those divisions of the madras army where cholera is more prevalent, than in the divisions where the proportion admitted from cholera is small.

TABLE XI.

DIVISIONS.	PERIOD.	Aggregate Strength.	Total Admissions.					Total Deaths.					Ratio per 1,000 of mean Strength.									
													Cholera.		Fevers.		Dysentery and Diarrhœa.		All other Diseases.		Total from all Diseases.	
			Cholera.	Fevers.	Dysentery and Diarrhœa	All other Diseases.	Total.	Cholera.	Fevers.	Dysentery and Diarrhœa	All other Diseases.	Total.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Not specified	6 years from 1821 to 1826	9,385	527	4,429	894	1,103	6,953	160	64	23	13	260	56·	17·0	471·	6·8	95·	2·4	117·	1·3	740·	27·7
Field Force Doab	10 years from 1821 to 1830	59,314	1,415	14,893	2,556	16,993	35,857	559	143	109	308	1119	23·	9·4	251·	2·4	43·	1·8	286·	5·1	604·	18·8
Ceded Districts	24 years from 1821 to 1844	102,110	2,388	21,432	2,493	29,852	56,165	923	276	99	498	1796	23·	9·0	209·	2·7	21·	0·9	292·	4·8	550·	17·5
Hyderabad Subsidiary Force and Jaulnah,	24 years from 1821 to 1844	222,290	4,448	61,217	6,124	61,192	132,981	1666	790	304	1060	3820	20·	7·4	275·	3·5	27·	1·3	275·	4·7	598·	17·1
Southern Division	24 years from 1821 to 1844	163,690	2,932	32,422	5,987	55,721	97,062	1254	427	349	873	2903	17·	7·6	198·	2·6	36·	2 1	340·	5·3	531·	17·7
Southern Mahratta Country	7 years from 1838 to 1844	42,527	731	7,349	1,407·	18,219	27,706	286	76	37	167	566	17·	6·7	172·	1·7	33·	0·8	428·	3·9	651·	13·2
Centre Division	24 years from 1821 to 1844	178,264	2,287	28,731	6,235	53,774	91,027	950	494	392	1401	3237	12·	5·3	161·	2·2	34·	2·1	301·	8·8	510·	18·1
Mysore Division	24 years from 1821 to 1844	194,170	2,294	63,810	6,664	56,236	129,004	962	898	424	1043	3327	11·	4·9	328·	4 6	34·	2·1	289·	5·3	664·	17·1
Northern Division	24 years from 1821 to 1844	205,387	2,220	66,018	5,542	69,816	143,596	890	1148	431	1773	4242	10·	4·3	321·	5·5	22·	2·0	339·	8·6	699·	20·5
Presidency Division	24 years from 1821 to 1844	148,779	1,281	21,182	4,618	45,186	72,267	540	306	382	967	2195	8·	3·6	142·	2·0	31·	2·5	303·	6·4	485·	14·7
Travancore Province	7 years from 1821 to 1827	19,823	149	2,155	422	8,400	11,126	33	33	19	107	192	7·	1·6	108·	1 6	21·	0·9	423·	5·3	560·	9·6
Malabar and Canara	19 years from 1826 to 1844	75,581	368	7,760	2,183	37,500	47,811	130	141	144	447	862	4·8	1·7	102·	1·8	28·	1·9	496·	5·9	632·	11·2
Nagpore Subsidiary Force	24 years from 1821 to 1844	119,255	429	40,279	2,179	27,911	70,798	211	468	90	620	1389	3·5	1·8	337·	3·9	19·	0·7	234·	5·1	593·	11·6
Eastern Settlements, China, Scinde, Aden and the Tenasserim Coast		114,661	878	48,524	20,260	66,893	136,555	272	682	1195	2081	4230										
Total		1,655,236	22,347	420,201	67,564	548,796	1,058,908	8836	5946	4098	11,258	30,138	13·5	5·3	253·8	3·5	40·8	2·4	331·5	6 8	639·	18·2

We observe then, from the above table, that there is a correspondence in the frequency of the attacks of cholera, and the frequent occurrence of fevers, amongst the native soldiers of the madras army. This point ought not to be examined, however, by a table such as the preceeding, for that which is really determined by its means is the frequency of cholera, fevers, &c., &c., in one cantonment compared with another, which is not the subject under investigation; the question being whether, when cholera breaks out in a place, the outbreak be or be not preceded or accompanied by an unusual prevalence of other acute diseases; for that there are great differences in the frequency of particular classes of disease in one country compared with another has been known for ages.

In every station of the madras presidency, however, cholera has been more or less prevalent every year, and the previous table may, therefore, be of some assistance in forming an opinion on this matter.

The admissions by cholera and one class of the recorded diseases—fevers, in the different divisions, are here contrasted.

TABLE XII.

Division, or Command.	Period.	Average Annual Ratio per 1,000 of mean strength admitted by	
		Cholera.	Fevers.
Division not specified	6 years	56·	471·
Field Force Doab	10 years	23·	251·
Ceded Districts	24 years	23·	209·
Hyderabad Subsidiary Force	24 years	20·	275·
Southern Division	24 years	17·	198·
Southern Mahratta Country	7 years	17·	172·
Centre Division	24 years	12·	161·
Presidency Division	24 years	8·	142·
Travancore Province	6 years	7·	108·
Malabar and Canara	19 years	4·8	102·
Nagpore	24 years	3·5	337·
Northern Division	24 years	10·	321·
Mysore Division	24 years	11.	328·

It would appear from the preceding table that where the native soldiers have been most numerously attacked with cholera, they have likewise been subject to the greatest number of admissions from fevers; and, as in Malabar and Canara, where there have been the fewest admissions from cholera there have been the fewest from fevers; Indeed (excepting in the Mysore, Northern and Nagpore Divisions) the proportion annually attacked with cholera and with fever seems to increase and decrease together. Is this a mere casual coincidence or is there some unknown connection between fevers and cholera? Taking into consideration what was observed from Dr. Nicholson's tables, viz. that out of the eleven (11) stations of which they furnish the diseases, in five of them, the quarters of the year of greatest cholera had the greatest fever quarters immediately preceding; in four, the quarters of greatest cholera and of greatest fever were coincident, and only in two stations was there no correspondence,—it may, at least, be allowed that this coincidence as to seasons of the year in the occurrence of much febrile disease with cholera, amongst the european and native soldiers of the Madras army, has been sufficiently frequent to induce the subject being further investigated. To be correctly determined, however, the monthly admissions and deaths in each cantonment should be examined one month with another, for it may justly be objected that quarterly periods, besides being too extended for such a delicate inquiry, are given above for a series of years, and therefore no correct deductions can be drawn from them. The subject merits further investigation however, and I trust that some one in possession of the necessary documents will undertake it.

Intensity of cholera.

On examining the returns of the european soldiers this disease appears to have been increasing in virulence from the period of its first outbreak. In the case of the native soldiers of the Madras army the

proportion of deaths to admissions continues nearly the same as in the earlier years of its appearance. It will be, likewise, observed that although native soldiers are less susceptible to the influence of this disease than europeans, yet, when seized, the proportion of them that recover is greatly less.

Its intensity in the two classes of troops viz: the european and native soldiers.

In the 26 years from 1821 to 1846, of 8382 european soldiers of the madras army admitted with cholera, 2494 died, or one death occurred in every 3·3 admissions; and 26,716 native soldiers were attacked in the same period of whom 10,752 died, being one death in every 2·4 admissions. This disparity in the proportion of deaths in the two races has been attributed to the greater powers of rallying in the european constitution; but, besides that the native soldiers in the Madras presidency are always longer ill than europeans before seeking assistance, and are more intractable, impatient, and despairing when under treatment, the difference is explicable in the known fact that this disease always proves very severe when cases occur amongst a people not generally liable to its attacks; and the native soldiers are in this position they are not so susceptible of the influence of cholera as europeans, and the few who are attacked seem to consist of individuals unusually predisposed to the disease, a class amongst whom it always proves very fatal.

The other remarkable point, however, is noticed in running the eye up the two columns, of the following table, where one is surprised to observe how little variation has occurred, one year with another, in the proportion of cases that have recovered, and particularly so amongst the native soldiers. In twenty out of the 26 years of the madras european returns the proportion has been one death in every two, three, or four cases admitted; and, in twenty out of the 26 years, amongst the native soldiers, the proportion has been one

death in every 2·2 cases admitted. In the whole period the europeans lost one case in every 3·3, and the natives one in every 2·4. It is evident however that the proportion of the european soldiers who now recover from an attack is less than in former years.

Return shewing the average strength, the Total Admissions and Total Deaths from Cholera, among the European and Native Soldiers of the Madras Army from 1818 *to* 1846.

TABLE XIII.

EUROPEAN SOLDIERS.						NATIVE SOLDIERS.					
Years.	Authority.	Average Strength.	Total admission from Cholera.	Total deaths from Cholera.	Proportion of deaths to admissions.	Years.	Authority.	Average Strength.	Total admission from Cholera.	Total deaths from Cholera.	Proportion of deaths to admissions.
1817	Madras Medical Board Records. Madras Printed Reports of 1844. Madras Medical Board Records.	Returns Incomplete.				1817	Madras Medical Board Records. Dr. Lorimer's Report on Cholera 1821 to 1844. Madras Medical Board Records.	Returns Incomplete.			
1818		10,033	1,645	Deaths not exhibited		1818		50,784	3,038	Deaths not exhibited	
1819		8,929	930	in the Returns under		1819		73,634	3,651	in the Returns under	
1820		9,903	356	the head of Cholera.		1820		81,644	3,335	the head of Cholera.	
1821		10,708	450	36	1 in 12.50	1821		81,468	2,962	841	1 in 3.52
1822		11,197	957	174	1 in 5.50	1822		74,707	559	199	1 in 2.80
1823		11,262	323	50	1 in 6.40	1823		71,378	945	348	1 in 2.71
1824		9,757	727	188	1 in 3.86	1824		68,435	1,675	545	1 in 3.07
1825		10,188	433	172	1 in 2.51	1825		74,922	1,930	717	1 in 2.69
1826		10,423	311	76	1 in 4.09	1826		82,562	938	294	1 in 3.18
1827		11,680	270	110	1 in 2.4	1827		84,128	560	283	1 in 1.98
1828		12,503	434	117	1 in 3.7	1828		76,224	819	368	1 in 2.22
1829		11,640	239	35	1 in 6.82	1829		71,945	501	213	1 in 2.35
1830		11,623	290	45	1 in 6.44	1830		67,106	264	126	1 in 2.09
1831		10,863	289	91	1 in 3.17	1831		61,623	640	271	1 in 2.36
1832		10,580	528	223	1 in 2.36	1832		60,678	808	333	1 in 2.42
1833		9,853	966	233	1 in 4.14	1833		60,099	1,228	579	1 in 2.12
1834		9,321	130	14	1 in 9.28	1834		58,854	115	58	1 in 1.98
1835		9,484	60	2	1 in 30.00	1835		56,777	12	2	1 in 6.00
1836		10,201	36	3	1 in 12.00	1836		56,844	63	27	1 in 2.33
1837		10,068	173	72	1 in 2.40	1837		57,274	702	351	1 in 2.00
1838		9,798	122	52	1 in 2.34	1838		58,320	1,187	502	1 in 2.36
1839		10,330	207	112	1 in 1.84	1839		66,514	530	249	1 in 2.12
1840		10,200	127	50	1 in 2.54	1840		71,188	272	122	1 in 2.22
1841		11,220	44	17	1 in 2.58	1841		72,234	561	241	1 in 2.32
1842		12,080	335	163	1 in 2.66	1842		74,618	1,771	741	1 in 2.39
1843		12,436	443	206	1 in 2.15	1843		73,763	2,139	905	1 in 2.35
1844		13,057	111	54	1 in 2.05	1844		73,577	1,166	521	1 in 2.23
1845		12,548	232	124	1 in 1.87	1845		74,861	1,714	708	1 in 2.42
1846		11,113	145	75	1 in 1.93	1846		74,682	2,655	1,208	1 in 2.19
1847			31	22	1 in 1.29	1847			227	78	1 in 2.91
26 years 1821 to 1846	Total..	284,133	8382	2494	1 in 3.3	26 years 1821 to 1846	Total..	1,804,779	26,716	10,752	1 in 2.4
29 years 1818 to 1846		312,998	11,313			29 years 1818 to 1847		2,010,841	36,740		

STATISTICS OF CHOLERA

TABLE XIII.

Years.	EUROPEAN SOLDIERS.					
	Authorities.	Average Strength.	Total admission from Cholera.	Total deaths from Cholera.	Proportion of deaths to admissions.	Years.
	Regulars.					
1817						1817
1818		10,023	1,846			1818
1819		8,729	9	Deaths not published		1819
1820		9,909	996	in the Returns under the head of Cholera.		1820
1821		10,708	460	36	1 in 12.80	1821
1822		11,197	917	174	1 in 6.80	1822
1823		11,202	823	80	1 in 6.40	1823
1824		9,787	727	188	1 in 3.86	1824
1825		10,188	638	178	1 in 3.61	1825
1826		10,423	819	76	1 in 4.00	1826
1827		12,080	270	110	1 in 2.4	1827
1828		13,703	434	117	1 in 3.7	1828
1829		11,040	289	35	1 in 6.89	1829
1830		11,023	290	46	1 in 6.14	1830
1831		10,803	289	91	1 in 3.17	1831
1832		10,360	528	223	1 in 2.36	1832
1833		9,863	960	238	1 in 4.14	1833
1834		9,321	130	14	1 in 9.28	1834
1835		9,184	60	2	1 in 30.00	1835
1836		10,201	36	3	1 in 12.00	1836
1837		10,068	178	72	1 in 2.40	1837
1838		9,705	122	52	1 in 2.34	1838
1839		10,380	207	112	1 in 1.84	1839
1840		10,200	127	66	1 in 2.94	1840
1841		11,220	44	17	1 in 2.58	1841
1842		12,080	286	168	1 in 2.66	1842
1843		12,486	448	206	1 in 2.18	1843
1844		13,087	111	64	1 in 2.05	1844
1845		12,948	232	124	1 in 1.87	1845
1846		11,113	146	76	1 in 1.92	1846
1847			31	22	1 in 1.29	1847
29 years 1818 to 1846	Total	284,188	8382	2464	1 in 3.3	29 years 1818 to 1846
29 years 1818 to 1846		313,203	11,313			29 years 1818 to 1846

If any change has occurred since 1817, in the intensity of this disease, amongst the native soldiers of the madras army, it has been increasing; the proportion that recover, now, being somewhat smaller than formerly: and we must either suppose (1st) that science has made no progress in the discovery of curative measures; or (2nd) that the agent that induces cholera is becoming more concentrated or less generally distributed; or (3rd) that the soldiers are less exposed to its action, and only those are now being attacked who are unusually susceptible to it, a class amongst whom (as was remarked at page 21) many fatal cases occur.

Value of Medical Treatment in Cholera.

With reference to the first of these hypotheses, it may be remarked, that the efficiency of medical treatment can be proved by comparing the mortality amongst patients who have applied early for assistance, with that amongst men who allowed the disease to remain a long time on them before seeking relief;—377 cases of cholera occurred in the 5th, 6th and 19th Regiments M. N. I.* in the year 1846, and the period of their application for medical relief at their regimental hospitals was as follows:

TABLE XIV.

	The total duration of the disease, before coming to hospital, was.	The average duration of the disease, coming to hospital, was.		
	hours	hours	min.	sec.
Of the 377 patients.....	1,899¾	5	2	4
Of the 176 cases, or 46 per cent that proved fatal,.....	1,001¼	5	41	20
Of the 201 patients, or 53 per cent, that recovered,.....	898½	4	28	12

* The 5th Regiment was stationed at Bellary, the 19th Regiment at Cuddapah, and the 6th Regiment was marching from Madras to Bellary.

It appears from the previous table that those patients who recovered applied for medical treatment nearly an hour and a half earlier than the men who died, and all who know how rapid the progress of this disease is, and how little can be done for it in its more advanced stages, will acknowledge the advantage that even this short interval gave. With a disease that proves fatal or otherwise in twelve or fifteen hours the difference of an hour and a half is a great matter.

The efficacy of treatment and of early treatment is perhaps better demonstrated by contrasting the rate of mortality among the patients who delayed longer than the average time in coming to hospital with that which occurred among the men who sought assistance earlier.

Of the 377 cases above alluded to

175 patients delayed longer than the average time of whom.	101 died and 74 recovered or..	per cent 57·7 died.
48 patients came at the average time of whom.	25 died and 23 recovered or..	52·0 died.
154 patients came sooner than the average time of whom.	50 died and 104 recovered or.	32·4 died.

Of the patients who delayed longer than the average time more than the half died, but only a third part died of those who received treatment early; the proportions having been 1 death in every 1·7 admissions; 1 death in every 1·9 admissions; and 1 in every 3 admissions as the patients delayed longer, came at, or came sooner than the average time, respectively.

Is the cholera Agent becoming more concentrated? or are the europeansoldiers less exposed to its influence.

Considering that we are still unacquainted with the cause of this as well as of most other diseases, it seems useless to enter into the discussion of the second position; and in asking whether the agent that induces cholera be now less abundant than formerly or the soldiers, be

less exposed to its action, it may be remarked that in the 26 years from 1821 to 1846 inclusive, the strength of the madras army and the admissions and deaths from cholera were as follows;

TABLE XV.

CHOLERA.

Period 26 years 1821 to 1846.	European Soldiers.			Native Soldiers.		
	Aggregate Strength.	Total Admissions	Total Deaths.	Aggregate Strength	Total Admissions	Total Deaths.
In the first 13 years viz. from 1821 to 1833	142,277	6217	1550	935,275	13,829	5117
In the second 13 years viz from 1834 to 1846.....	141,856	2165	944	869,504	12,887	5635
Total. ..	284,133	8382	2494	1,804,779	26,716	10,752

The ratio per 1,000 of the strength admitted, and the proportion of deaths to admissions in these two periods have been as follows ;

TABLE XVI.

CHOLERA.

Period 26 years 1821 to 1846.	European Soldiers.		Native Soldiers.	
	Ratio per 1000 of mean strength admitted.	Proportion of deaths to admissions.	Ratio per 1000 of mean strength admitted.	Proportion of deaths to admissions.
In the first 13 years viz from 1821 to 1833.....	43·7	1 death in 4·01 admissions	14·7	1 death in 2·7 admissions
In the second 13 years viz from 1834 to 1846.	15·2	1 death in 2·2 admissions	14·8	1 death in 2·2 admissions
Total 1821-1846...	29·5	1 death in 3·3 admissions	14·	1 death in 2·4 admissions

It will be observed that the number of the native soldiers who have been attacked has scarcely varied in the two

periods, the annual admissions having been 14·7 per 1,000 in the thirteen years from 1821 to 1833, and 14·8 per 1,000 in the thirteen years from 1834 to 1846; the proportion of deaths to admissions also, is almost the same now as formerly, having been one death in every 2·7 admissions in the former, and one death in every 2·2 in the latter period.

A very great change has, however, taken place in the proportion of the european soldiers attacked with it, for in the 13 years from 1821 to 1833, 43· per 1,000 of the strength were annually admitted, and only 15· per 1,000 in the latter thirteen years. But while there have been fewer admissions latterly, amongst the european soldiers, a much smaller number of those attacked with it have recovered, the proportion of deaths to admissions having been 1 in every 4·01 in the earlier period, and 1 in every 2·2 in the later period.

As even more of the native soldiers are now being attacked with cholera than formerly it cannot be said that the agent is disappearing from the country, and the decreasing number of admissions among the europeans, a decrease of from 43· to 15· per 1,000 annually, is only to be explained by supposing that they have been less exposed to the causes that induce the disease; while the increased intensity, from one death in every 4·01 admissions, in the former, to one in every 2·2, in the latter period, must be attributed to the circumstance that the comparatively small number who are now attacked, consist of men unusually susceptible to the influence of the disease a class amongst whom, as was previously remarked, many deaths occur. Contrasting the admissions and deaths of the european and native soldiers, the inference, certainly, is that the cholera agent is as abundant and as virulent as ever, but that the class of european soldiers now admitted, have less powers of rallying from an attack than the patients of former years.

The Intensity of Cholera has varied but little wherever it has appeared.

Another interesting fact connected with this disease is that while its intensity continues almost the same as after its first outbreak in 1817, the severity has varied but little in whatever country and under whatever circumstances it has appeared. Amongst large bodies of troops, comfort and ease, or labour and privations have exercised considerable influence on the liability to be attacked and on the extent of the outbreak, but when once it has broken out the proportion of deaths to admissions has not greatly varied. Thus the native soldiers of the madras army when at ease in cantonments have had a smaller proportion of their strength attacked than when marching from station to station, but the proportion of deaths to sick have been the same in either case; so whether it has appeared amongst them in a sporadic or epidemic form, or whether regiments were attacked when marching through villages already affected with it, or in districts where no cholera prevailed, there has been much difference in the proportion of the strength attacked, but little or none as to the proportion of deaths to admissions. This will be observed from the following table extracted from Dr. Lorimer's cholera report.

TABLE XVII.

Showing the Aggregate Strength, and the total admissions and total deaths from Cholera amongst the Native Soldiers of the Madras Army in the 24 years from 1821 to 1824.

	Aggregate strength.	Total admissions by Cholera.	Total deaths by Cholera.	Ratio per 1,000 of mean strength: Admitted.	Ratio per 1,000 of mean strength: Died.	Proportion of deaths to admissions.	Authority Report on Cholera
When living in cantonments	1,608,830	13,686	5,261	8·5	3·2	1 in every 2·6	page 36
When marching	413,946	8,661	3,575	20·9	8·6	1 in every 2·4	36
83 times Attacking Troops on the march in an epidemic form when prevalent in the villages through which the troops were marching	62,758	7,357	3,016	117·	48·0	1 in every 2·4	8 & 9
5 times Attacking Troops on the march in a sporadic form when prevalent in the villages	894	13	5	14·5	5·5	1 in every 2·6	8 & 9
28 times Attacking Troops on the march epidemically when not prevalent in the villages	20,748	1,367	550	6·5	26·5	1 in every 2·4	8 & 9
23 times Attacking Troops on the march sporadically when not prevalent in the villages	14,160	110	43	7·7	3·0	1 in every 2·5	8 & 9
10 times Attacking Troops on the march (other circumstances not detailed) epidemically	9,245	652	267	70·5	28·8	1 in every 2·4	8 & 9
3 times Attacking Troops on the march (other circumstances not detailed) sporadically	1,515	21	9	13·8	5·9	1 in every 2·3	8 & 9

It will be observed that the liability to be attacked has differed greatly according to circumstances, yet, once ill, there has been little or no difference in the number of recoveries. But, as was remarked, this unchanging intensity is not peculiar to the countries in which the Madras native soldiers are employed though they occupy 370,000 square miles of territory, for returns demonstrate that it has but slightly varied amongst the British soldiers attacked with it in countries wide apart, a fact which is well shown by the following table.

TABLE XVIII.

	COUNTRY AND FORCE	YEARS OR PERIODS.	No. of admissions.	No. of deaths.	Proportion of deaths to admissions.
a	Moulmein, H. M. Regiments,	for 11 years, from 1829 to 1840 exclusive of 1834	4	1	1 in 4
b	Berhampoor, European Soldiers,	for 10 years, for 1823 and from 1826 to 1834	642	169	1 in 3.79
b	Chinsura, European Soldiers,	for 8 years, from June 1826 to June 1827 and 1830 to 1836	235	64	1 in 3.67
b	Calcutta, European Soldiers,	for 10 years, from 1827 to 1838	240	75	1 in 3.20
a	Masulipatam, H. E. I. Co's. Artillery,	for 2½ years, from 1st March 1832 to 31st August 1833 and M. E. Regiments from 1st July 1826 to 30th June 1832.	113	32	1 in 3.3
a	Fort Saint George, Madras, H. M. Regiments and H. E. I. Co.'s Artillery	for 10 years, from 1829 to 1838	392	136	1 in 2.8
a	St. Thomas' Mount, H. E. I. Co.'s H. A. and Foot Artillery	for 9 years, from 1829 to 1838 exclusive of 1831. for 10 years, from 1829 to 1838	36	8	1 in 4.5
a	Nagpore. H.E.I. Co.'s European Regiment	for 10 years, from 1829 to 1839 exclusive of 1831.	155	40	1 in 3.8
	H.E.I. Co.'s European Horse Artillery.	for 10 years, from 1829 to 1839			
	H.E.I. Co.'s European Foot Artillery.	for 10 years, from 1829 to 1838			
a	Jaulnah.... H.E.I. Co.'s European Horse Artillery.	for 11 years, from 1829 to 1841 exclusive of 1831 and 1835	17	7	1 in 2.4
a	Secunderabad H. M. Regiments	for 10 years, from 1829 to 1839 exclusive of 1833	81	31	1 in 2.6
	H. E. I. Co.'s Foot Artillery	for 12 years, from 1829 to 1340			
c	Bellary H. E. I. Co.'s Foot Artillery	for 13 years, from 1827 to 1839	44	16	1 in 2.8
	H. M. Regiments	for 22 years, from 1818 to 1839	869	276	1 in 3.1
a	Bangalore, H. M. Hussars,	for 9 years, from 1830 to 1838; H. M. Infantry for 8 years 1831 to 1838; H. E. I. Co.'s Horse Artillery for 11 years from 1829 to 1842; Foot Artillery for 12 years from 1830 to 1841	292	79	1 in 3.6
a	Trichinopoly, H. M. Regiments	for 9 viz., years 1829, 1831, 1833 to 1837 and 1839; and H. E. I. Co.'s Foot Artillery from 1832 to 1841	53	29	1 in 1.8
a	Cannanore. H.M.Regiments and H.E.I.Co.'s Artillery.	for 10 years, from 1829 to 1838	76	13	1 in 5.4
d	Ceylon, H. M. Regiments	for 15 years, from 1818 to 1832	788	257	1 in 3.0
d	Great Britain, Dragoon Guards and Dragoons	for 3 years, 1832, 1833 and 1834	171	54	1 in 3.05
d	Gibraltar, H. M. Regiments	1 year 1834	459	131	1 in 3.48
d	Nova Scotia and New Brunswick, H. M. Regiments.	for 1 year 1834	210	59	1 in 3.5
d	Canada, H. M. Regiments	for 2 years, 1832 and 1834.	356	127	1 in 2 80
e	American Army, American Soldiers,	for 4 years, from 1832, 1834 and 1835	686	191	1 in 3.59

a Reports on the Madras Army. b Johnston and Martin on Tropical climates. c Madras Journal. d Colonel Tulloch's Statistical Reports of the British Army.
e Dr. Forry's Reports.

It will be noticed from the preceding table that although cholera in its westerly progress took fifteen years to reach Britain and the continent of America, the proportion among the english soldiers of the madras army from 1821 to 1846 was one death in every 3.3 admissions; in Great Britain from 1832 to 1834 it was 1 death in every 3.05 admissions—and in the same years from 1832 to 1835, according to Dr. Forry, the american soldiers lost 1 in every 3.5 admissions.

Since the year 1818 the white troops serving in Ceylon have suffered on seven occasions from cholera and the following statement will determine if any material change has occurred in the intensity of the disease in that island.

TABLE XIX.

YEARS.	1818	1819	1820	1821	1825	1829	1832	Total.
Number of admissions from Cholera	4	236	42	3	111	48	344	788
Number of deaths from Cholera	2	89	12	2	31	14	107	257
Proportion of deaths to admissions 1 in every	2	2.6	3.5	1.5	3.6	3.4	3.2	3.0

Influence of Age on recovery.

In bodies of men, such as our native regiments are composed of, the majority of the men in the ranks being from 25 to 29 years of age, it is difficult for an individual to obtain a sufficient number of cases to ascertain the mortality amongst patients at different periods of life. Of the 377 cases, however, already alluded to (at page 24) their total ages amounted to 10,559 years and their average age to 28.00 years; 201 of them recovered, whose total ages amounted to 5,406 years, their average age to 26.89 years, and 176 of them died, whose total ages amounted to 5,153 years, and their average age to 29.27 years.

The average age of the fatal cases was greater than that of all the 377 patients by 1.27 years, and greater, by 2.38 years, than the average age of the men who recovered. It was comparatively upon the older soldiers, therefore, that the mortality fell.

The influence of age on mortality may also be ascertained by comparing the proportion of deaths among patients at different ages. Of these 377 cases, whose average age was 28.00 years, 141 of the patients were above the average age, of whom 78 died and 63 recovered, being 55.31 per cent. of deaths. 12 of the patients were at the average, of whom 3 died and 9 recovered, being 25.00 per cent. of deaths. 224 of the patients were below the average age, of whom 95 died and 129 recovered, being 42.41 of deaths.

The deaths among the older patients was 13 per cent. higher than among the younger men, the proportion of deaths to admissions being one death in every 1.8 admissions and one in every 2.3 respectively, showing, thereby, the greater powers of rallying (the stronger viability) in the younger soldiers.

When cholera broke out in Colombo in 1832 "the influence of length of residence in the island as a means of protection against the disease has been thus demonstrated" Ceylon Report p. 21.

TABLE XX.

	There were at that time in the Garrison.	Whereof attacked.	Whereof died	Proportion of deaths to admissions.
"Of those who arrived in Ceylon with their corps some years before	926	186	35	1 in 5·3
Of recruits subsequently arrived	147	41	4	1 in 10·2

"Of the former class one-fifth only were attacked but nearly 4 per cent died, of the latter one in $3\frac{1}{2}$ were attacked but only $2\frac{3}{4}$ per cent died: being for the most part younger men it is probable superior vigour of constitution enabled a greater proportion of them to overcome the disease."—p. 21.

Influence of habits of Life on recovery.

"The following calculations have also been made from the same source with the view of determining whether the liability to, or mortality from the disease was in any way influenced by the character of the individuals.

TABLE XXI.

	There were at that time in the Garrison.	Where of attacked.	Where of died.	Proportion of deaths to admissions.
"Of Regular sober and well conducted soldiers	853	172	27	1 death in 6·3
Of Drunken and irregular habits.....	220	55	12	1 death in 4·5

"Of the drunken and irregular a fourth part was attacked and from 5 to 6 per cent died, while of the sober and well conducted only a fifth part was attacked, and from three to four per cent died, thus showing a marked exemption in favour of the latter."—*Ibid* p. 21.

Influence of Age, Sex, and rank of life on susceptibility and recovery.

The Reports on the madras army also supply some information which may assist us in forming an opinion as to the liability to be attacked and the mortality amongst the sick of different ranks and ages. From these reports, the following is extracted, showing the aggregate strength and the Total admissions and deaths from cholera amongst the officers, men, women and children of H. M. Regiments in the cantonments of Fort St. George, Bangalore, Trichinopoly, Cananore, Bellary, Secunderabad, and Moulmein.

TABLE XXII.

	Officers.			Men.			Women.			Children.		
		Total.			Total.			Total.			Total.	
	Aggregate Strength.	Admitted from Cholera.	Died from Cholera.	Aggregate Strength.	Admitted from Cholera.	Died from Cholera.	Aggregate Strength.	Admitted from Cholera.	Died from Cholera.	Aggregate Strength.	Admitted from Cholera.	Died from Cholera.
	2319	21	9	54,349	762	257	6557	109	38	9877	109	53
Proportion of admissions to strength 1 in every..		110·				71.			60.			90.
Proportion of deaths to admissions 1 in every ...		2·3				2.9			2.8			2.0

The officers have suffered the least from the attacks of this disease; the children next; and after them the men, and then the women; but of the deaths in proportion to the admissions, first the children, then officers suffered most, and the men and women least.

The influence of fatigue, exhaustion, and other physically depressing circumstances on the susceptibility and recovery.

It has been already pointed out (at page 29) that the native soldiers of the Madras army have had a much larger proportion of their strength attacked when marching, than when living at ease in cantonments; and the following table will show that the proportion of their strength attacked has increased with the length of their journey, with the number of days they were occupied on the journey, and the number of men congregated together.

What this proportion amounted to will be ascertained from the following tables, extracted from Dr. Lorimer's valuable report—

1st. With reference to the distance marched; vide Reportp.3.

TABLE XXIII.

Distance of each march.	Under 200 miles.	200 to 400 miles.	400 to 600 miles.	600 to 800 miles.	800 to 1050 miles.	Total.
Number of marches in each distance.....	176	274	99	45	8	602
Number of times attacked	15	93	33	21	6	144
Ratio of attacks to marches per cent	8.5	33.9	33.3	46.6	75.0	23.9

2d. With reference to the number of days on the march. p. 3.

Number of days on the march.	Under 20 days.	20 to 40 days.	40 to 60 days.	60 to 80 days.	80 to 100 days.	100 to 120 days.	120 days & upwards.	Total.
Number of marches.....	137	219	120	74	18	14	20	602
Number of times attacked..	11	39	39	30	8	7	10	144
Ratio of attacks to marches per cent.....	8.0	17.7	20.2	40.5	44.4	50.0	50.0	23.9

3rd. With reference to the numbers congregated together. p. 38.

Effective Strength.	100 to 300 men.	300 to 500 men.	500 to 700 men.	700 to 900 men.	900 to 1100 men	1100 to 1534 men	Total.
Number of times attacked.....	17	15	21	54	35	9	151
Ratio per 1000 of the strength attacked....	61.6	68.0	58.1	89.0	86.2	132.1	86.9

When a marked difference was observed to exist between the proportion of the strength attacked when in cantonments and when marching, it was to be expected that whatever tended to exhaust the physical powers of the men would be found to increase their liability to be attacked.

The proportion of regiments attacked has been smallest when the distance marched, the number of days the march

occupied, and the assemblage of human beings have been least; and as the length of the journey, the period occupied on it, and the numbers congregated together, have increased, the liability to have cholera breaking out has increased likewise.

This information derived from Dr. Lorimer's very valuable report on cholera is fully borne out by the results he obtained from examining the returns from the smaller bodies of men moving on treasure detachments, but the above results are so satisfactory, that it is not necessary to examine the attacks among these smaller bodies here.

In connection with these remarks on the influence exercised by the physical condition of the troops and their liability to be attacked when marching, it would appear that the different branches of the native army have been attacked in unequal proportions. In the 13 years from 1832 to 1844 the ratio of attacks to marches was 11.7 per cent. in the sappers and miners; from 1820 to 1844, it was 20.2 per cent. in the cavalry, and 24.6 per cent. in the infantry; and it was 50 per cent. in the artillery from 1831 to 1844, "the sappers and miners having been the least liable to this disease, and the artillery the most obnoxious to it." *Ibid* p. 2.

The following tables obtained from the same source, (page 6) will point out the connection that exists between the outbreaks of cholera among the troops, when marching, and the state of the weather, and season of the year.

TABLE XXIV.

Nature of the weather recorded on the march.	Cool and Dry.	Hot and Dry.	Cool and Rainy.	Hot and Rainy.	Variable.	Not given.	Total.
Number of marches made.....	228	136	89	53	19	77	602
Number of out-breaks.....	40	26	32	19	13	14	144
Ratio of attacks to marches per cent	17.5	19.1	35.9	35.8	68.4	18.1	23.9

Fewest outbreaks occurred in dry weather, whether the temperature was cool or hot. In rainy weather, the proportion of outbreaks was doubled, and most occurred when the weather was variable, the attacks, then, being quadruple the rate that occurred during dry weather.

The season of the year seems, likewise, to influence the occurrence of this disease. p. 7.

TABLE XXV.

Months.	August.	November.	December.	February.	October.	April.	March.	September.	July.	January.	June.	May.	Total.
Number of marches commenced in each month...	21	44	79	84	49	49	73	32	13	98	22	38	602
Number of Epidemic attacks.	2	5	11	15	9	9	14	7	3	23	6	14	118
Number of Sporadic attacks.	0	2	4	0	4	3	2	2	1	5	1	2	26
Ratio of Epidemic attacks to marches per Cent.....	9.5	11.3	13.9	17.8	18.3	18.3	19.1	21.8	23.0	23.4	27.2	36.8	19.6

There are only three points remaining to be noticed from the sources of information under review, the first, obtained from the Madras Reports, exhibits the intensity of the disease at two periods of the year.

In the ten years from 1829 to 1838 the admissions and deaths among the european and native soldiers of the Madras army have been as follows :

TABLE XXVI.

10 years 1829 to 1838.

	1st six months of the years.					2d six months of the years.				
	Total.		Ratio per 1000 of mean strength		Proportion of deaths to admissions	Total.		Ratio per 1000 of mean strength		Proportion of deaths to admissions
	Admitted.	Died.	Admitted.	Died.		Admitted.	Died.	Admitted.	Died.	
Europeans	1,757	396	16.9	3.8	1 in 4.4	1,076	374	10.4	3.6	1 in 2.8
Natives...	3,255	1,438	5.7	2.5	1 in 2.2	2,091	975	3.6	1.7	1 in 2.1

It will have been noticed, previously, when examining the quarterly record from Dr. Nicholson's tables, that cholera occurred more at some quarters of the year than at others, and the preceding table affords further proofs of the influence of the seasons on the prevalence, as well as the intensity of this disease. More european soldiers were admitted in the first than in the second half of the year, the proportion of the strength admitted being 16·9 and 10·4 per 1,000, at these two seasons respectively ; but as only one death took place in every 4·4 of the admissions in the first half of the year, while one in every 2·8 of the patients died in the second half, this greater intensity made the actual loss of lives nearly alike at both seasons, 3·8 per 1,000 of the strength having died in the first half of the year and 3·6 per 1,000 in the second half.

The second point to be alluded to is the duration of an attack of cholera when occurring in an epidemic form amongst

native soldiers when marching. At p. 10. of the cholera report is the following:

Return showing the number of days the cholera continued, with corps marching, in each epidemic attack from 1820 to 1844 inclusive.

TABLE XXVII.

Duration of each out-break	Under 10 days	From 10 to 20 days	From 20 to 30 days	From 30 to 40 days	From 40 to 50 days	From 50 to 60 days	From 60 to 80 days	Total.
Number of regiments attacked.	18	42	28	18	6	6	3	121

Of the 121 Epidemic attacks, the disease disappeared in 60 corps within 20 days, and, within 40 days, it disappeared from 106 corps out of 121.

It would moreover appear, from a table at the same page, that this disease when it assumes an epidemic form presents the three stages, 1st. that of its accession, which lasts four or five days, during which the cases that occur are few in number and of little severity; 2nd, the virulent stage then commences, and lasts for 8 or 9 days, during which numerous cases occur; 3d, the disease then declines in frequency, and within the next ten days it disappears, the average duration of the epidemic being only 24 days.

The history of 20 of the more severe epidemic attacks is thus recorded:

TABLE XXVIII.

Period 1821 to 1844.	Duration of Epidemic.							Virulence of Epidemic.					
	Number of Regiments.	Strength.	Days.	Number attacked.	Number died.	Per day. Admitted.	Per day. Died.	No. of days before the disease became virulent.	Duration of virulence.	Number attacked.	Number died.	Per day. Admitted.	Per day. Died.
Total...	19 Regts. were attacked.	17,878	483	2,706	1,181	120	51	93	174	2104	959	227	100
Average		893.9	24.1	135.3	59.0	6	2.6	4.6	8.7	105	47.9	11.3	5

In these 19 regiments 4½ days elapsed on the average before the disease assumed its virulent character; for the nine succeeding days the disease was both more frequent and somewhat more intense; and in the following eleven days, on the average, it disappeared. Another arrangement of these data will make the intensity of the different stages, more apparent.

TABLE XXIX.

	There were attacked.	There died.	Proportion of deaths to attacks.
Amongst the 19* Regiments during the continuance of the Epidemic	2706	1181	1 in 2·29
Deduct the numbers recorded as having occurred in the 8·7 days of the virulent stage	2104	959	1 in 2·28
Leaving the numbers that occurred previous and subsequent to the period of virulence....	602	222	1 in 2·71

It will be observed that 2104 or three fourths of all the admissions took place in the 9 days that the virulent stage lasted, the remaining 602 admissions having occurred during the 15 preceding and succeeding days. It will be observed also, that the disease was then virulent both as to the numbers attacked and as to the intensity of the disease, the proportions of deaths to admissions having been 1 in every 2·2 or 45 per cent, whilst the virulence continued, while only one death in every 2·7 admissions or 36 per cent of deaths occurred amongst the patients admitted during the 4½ days before and the 11 days after this virulent period.

Each of these two tables contain data from which important deductions may be drawn. They show the value of

* The Regiments were the 3d, 4th, 9th, 10th, 11th, 15th, 16th, 19th, 23d, 24th, 30th, 36th, 38th, 42d, 43d, 46th twice, 47th, 48th, and 52d, M. N. I.

curative measures to be different during the periods of accession, virulence, and decline; they show that with regiments marching even the severest epidemics have not, on the average, continued longer than 24 days, and this combined with the knowledge of its three stages will enable us to regulate our measures of prevention.

When examining the returns from bodies of troops in the same or neighbouring cantonments, the attention is almost immediately arrested by observing the difference in the ratio of admissions from cholera in places closely adjoining each other. It will be observed, for instance, in the following table, that the europeans stationed in Fort St. George, from 1829 to 1838, had 28·03 per 1,000 of their strength admitted from cholera, while the europeans at Poonamallee, 13 miles distant, had only 4·36 per 1,000 of their strength admitted during the same period.

A similar difference is observable in the returns from the europeans at St. Thomas's Mount, a station 10 miles distant from Fort St. George, the european horse artillery there having had 13·36 per 1,000 admitted from cholera in the 10 years from 1829 to 1838, while the european foot artillery, a few hundred yards off, had only 2·5 per 1,000 admitted during the same period; and these instances are so numerous, that they may be arranged in the following tabular form.

Table XXX Showing the ratio per 1,000 of mean strength of troops in adjoining localities, attacked with cholera.

	Average annual Ratio per 1,000 of mean strength admitted.
Fort St. George.—European Infantry and Artillery for 10 years 1829 to 1838	28.03
Poonamallee.....(13 miles distant) Europeans, 10 years 1829 to 1838	4.36
St. Thomas' Mount—(10 miles from Fort St. George) European Horse Artillery 9 years 1829 to 1838 exclusive of 1831,	13.36
European Foot Artillery, 1¼ mile distant, from the Horse Artillery 10 years 1829 to 1838	2.50
Secunderabad.. .H. M. European Infantry, 10 years 1829 to 1839 exclusive of 1833	9.91
H. E. I. Co.'s European Foot Artillery 1¼ mile distant, 1829 to 1840	4.34
Kamptee.....H. E. I. Co.'s Madras European Regiment, 10 years 1829 to 1839 exclusive of 1831	19.26
H. E. I. Co.'s European Horse Artillery 1829 to 1839 inclusive	11.12
H. E. I. Co.'s European Foot Artillery, 1829 to 1839	8.26
Trichinopoly....H. M. European Infantry for 1829 to 1831, 1833, to 37 and 39	8.02
H. E. I. Co.'s European Foot Artillery from 1832 to 1841	3.14
Bangalore.....H. M. European Infantry, 8 years 1831 to 1838	34.61
H. M. Dragoons (contiguous to above) 9 years 1830 to 1838	13.16
H. E. I. Co.'s Foot Artillery ¼ mile distant, 12 years 1830 to 1841	9.00
H. E. I. Co.'s Horse Artillery, contiguous to Foot Arty. 11 years 1829 to 1842.	4.81
Bellary.....H. E. I. Co.'s Foot Artillery, 9 years 1833 to 1841	28.93
H. M. European Infantry, contiguous, 10 years 1829 to 1838	19.36
Madras.....Native Infantry 10 years 1829 to 1838	4.37
St. Thomas' Mount—10 miles distant, Native Golundauze, 9 years, 1829 to 1838, exclusive of 1842.	3.84
Palaveram.....13 miles distant, Native Infantry (period not specified)	0.25

1832.

RESUME AND DEDUCTIONS FROM THE PRECEDING TABLES.

Cholera is now an endemic disease in India.

In the annual returns forwarded by the three Medical Boards, it has hitherto been usual with them to record cholera, separately, as if it were a disease arising from some temporary cause which would in a short time wear itself out, but its annual outbreaks, for the past thirty years, in one part or another of the Indian Empire, and the extent to which it continues to occur, hold out no prospect of its early disappearance, and it seems to have now become an endemic disease which assumes sometimes an epidemic and occasionally a sporadic character. Its source or the agent inducing it continues wholly unknown, and although we are similarly situated with reference to most diseases, yet as several points connected with the appearance and progress of cholera have directed an unusual degree of attention to the discovery of its cause, it is somewhat surprising that this has not been even conjectured. The little that we have learned relates solely to the manner of its appearance and development, and considering the efforts that have been made, it must either be allowed that science has made very small progress towards detecting the agents which produce disease, or that in this malady it has escaped observation from its extreme subtilty. If the latter be the true cause of its remaining hid, to ascertain it would perhaps be of little practical importance, owing to the impossibility of guarding against so very subtile a power.

Source or cause of cholera unknown.

Its influence on different races of men.

Europeans more susceptible to its attacks than natives.

The susceptibility of european and native soldiers to the influence of this disease is very different. In the 20 years from 1825 to 1844 inclusive, the proportion of the strength of the Indian army that died from it has been 7· per 1000 annually of the european arm of

the service, and 3· per 1000 of the native soldiers; and it is shown (by the table at page 4) that this disparity is the consequence of a difference in the impression made by the agent on the two classes of troops; as, at Fort St. George, Madras, for instance, the european soldiers had 28· per 1000 of their strength annually attacked, but their native comrades only 4·3 per 1,000; and in Kamptee (and Seetabuldee?) 15·9 per 1,000 of the european soldiers were annually attacked with cholera, but only 3· per 1,000 of the native soldiers; and as great differences are observed in the proportion of the two classes of troops attacked with this disease in the cantonments of St. Thomas' Mount and Bellary. In this feature, it presents a resemblance to several other diseases, fevers, small pox, &c. &c. as they manifest themselves in other countries, attacking different races in very dissimilar proportions.

It is possible, indeed probable, that several points which have hitherto been deemed inexplicable, connected with the manner that cholera developes itself, may be cleared up by the knowledge of this single fact; particularly the many instances which have occurred of regiments when marching through districts perfectly free from cholera being attacked with the disease in a virulent epidemic form and losing great numbers of their soldiers; the possibility being that the agent although present in the district has no power over the less susceptible native inhabitants, but exerts its full influence on the stranger races of whom the regiment is composed; and the fact of two native regiments marching at the same time, along the same route, and through the same villages, and crossing each other on their journey, the one regiment suffering severely from cholera, while in the other regiment not a single case occurs, may likewise be referrible to the same law. Those acquainted with the composition of the Madras native army, the native cavalry for instance

composed wholly of mahomedans raised around Arcot; many regiments of native infantry recruited wholly among the Telingas in the northern sircars, and others exclusively from the Dravida country in the southern part of India, will not fail to perceive that as wide a difference in the degree of susceptibility to the influence of the cholera agent may exist between these different people as is observed between european and native soldiers; and the knowledge of this fact may likewise help to dispel the obscurity which has rested on the laws that regulate this disease when appearing in a cantonment and attacking different regiments in it in widely different proportions.

Native soldiers could be safely located in stations where european soldiers would suffer severely from this disease.

The evident and practical deduction from the knowledge of this law, is that in a post or cantonment where one race, european soldiers for instance, would suffer a severe loss from this disease, another race, such as our native soldiers, would scarcely feel its influence,—a point of much importance in the distribution of troops. Further observation is requisite to determine the different degrees of susceptibility existing among the various nations in India, but the fact that europeans are more liable to be attacked with cholera than natives is established, and this will guard us against too rashly concluding that, because native soldiers or the native inhabitants of a locality are never attacked with cholera, europeans would necessarily enjoy a like immunity if located along with them: It being clear that one race or people enjoying an immunity from cholera is no proof that another race would be equally secure.

The absence of cholera amongst the native inhabitants or native soldiers is no test that european soldiers would enjoy a like immunity.

An outbreak of cholera is accompanied by an unusual prevalence of other severe diseases, and the mortality is much increased above the average of other years.

It is evident from the table (at pages 6 and 7) that in years when cases of cholera are unusually frequent, in addition to the deaths it occasions, the fatal cases from other diseases likewise increase, so that the mortality becomes considerably higher than in ordinary years. The admissions are not more numerous, indeed they are generally fewer than in ordinary seasons, but this increased mortality is caused by other severe complaints occurring at the same season as the outbreaks of cholera. Amongst the european soldiers in the madras presidency, fevers, liver disease, dysentery and diarrhœa, have been the principal associated or coincident diseases which preceded or accompanied the outbreak of cholera. This association was particularly marked with respect to fevers, for in five out of eleven european stations the great cholera quarters were preceded and in four accompanied by an unusual display of febrile complaints. There is also a coincidence observable in the prevalence of cholera and fevers among the native soldiers of the Madras army, for in twelve out of fifteen of the military divisions held by this class of troops, where there was much cholera there was much fever, and in divisions with few admissions from cholera, the admissions from fever were likewise few; indeed many eminent men have maintained that fevers, dysentery, diarrhœa, rheumatism and cholera are allied diseases, and the association here observable tends to support their belief. It is clear, however, that when an outbreak of cholera occurs, although there may be a decrease in the year in the total of admissions, the more frequent occurrence of a few of those diseases which are the principal cause of mortality will increase the deaths considerably above the rate of ordinary years.

Europen soldiers are now less frequently attacked with cholera than formerly. But there has been no material decrease in the number of admissions among the native soldiers.

Notwithstanding the number of deaths that still occur the table at page 23 shows, that the Madras european soldiers are less frequently attacked now than in former years.

TABLE XXXI.

Ratio per 1,000 of the strength.	5 years from 1818 to 1822.	5 years from 1823 to 1827.	5 years from 1828 to 1832.	5 years from 1833 to 1837.	5 years from 1838 to 1842.	years from 1838 to 1842.	In the total period 29 years from 1818 to 1846.
Of european soldiers attacked..	85.4	38.6	31.2	29.9	15.5	18.9	36.
Of native soldiers attacked.....	37.	19.	8.	6.	12.	22.	18.

The cholera agent is as abundant as ever.

The agent does not, however, appear to be less abundant, for the native soldiers of the Madras army are just as numerously attacked now as ever they were, and it is probable that the improvements which have been introduced in the diet, clothing, and accommodation of the european soldiers, and the greater ease and comforts which they now enjoy, enable them better to resist, and expose them less to the influence of the disease, and thus be less frequently attacked with it.

While cholera has been decreasing in frequency amongst the european soldiers its intensity has been increasing.

Whatever be the explanation, however, the disease is now of less frequent occurrence among the european soldiers than in the earlier years of the period under review, but, while the admissions have been

becoming fewer, it has been acting with increasing intensity on the patients attacked, the proportion that now recover being smaller than in the earlier years of its outbreak.

TABLE XXXII.

Proportion of deaths to admissions.	Period.	2 years 1821 and 1822.	5 years 1823 to 1827.	5 years 1828 to 1832.	5 years 1833 to 1837.	5 years 1838 to 1842.	4 years 1842 to 1846.	In the total period 29 years 1818 to 1846.
Europeans, 1 death in every...		6.7	3.5	3.4	4.2	2.1	2.0	3.3
Natives, 1 death in every... ...		3.3	2.7	2.3	2.0	2.3	2.2	2.4

As the native soldiers are as numerously attacked, and the deaths among their sick, nearly as great, now, as in former years, this increased intensity of the disease amongst the european soldiers, when taken in connection with the fact that there has been an annual decrease in the number of admissions, can only be explained by supposing that as a body they are better protected from the disease than formerly, and that it is now only attacking men unusually predisposed to it, a class on whom an attack of illness makes a great impression.

The outbreak of cholera influenced by physical causes.

While ignorant of the morbific cause that produces cholera, we have become acquainted with the fact, that whether appearing amongst bodies of men, or amongst the many classes of which these bodies are composed, certain physical conditions attend its development, and seem to influence the extent and intensity of its outbreaks. It has been shown (in the tables X and XXVI) that it occurs more frequently and is more severe at one period of the year than another, and it appears from the Madras tables, for the ten years from 1829 to 1838, that the

admissions and deaths amongst the european soldiers of the Madras army at two periods of the year were as follows.

TABLE XXXIII.

	Europeans.		Natives.	
	1st half year.	2d half year.	1st half year.	2d half year.
Ratio per 1,000 of mean strength admitted.	16.9	10.4	5.7	3.6
Proportion of deaths to admissions, 1 in every.....	4.4	2.8	2.2	2.1

There were more admissions in the 1st half of the years, but the disease was more intense in the 2d half.

Certain states of the atmosphere have usually attended its outbreaks among the Madras native soldiers on the line of march, these having occurred oftener in variable and rainy weather than when the weather was dry.

The native soldiers have been attacked in greater numbers when marching than when residing in cantonments, the number of admissions in the 24 years from 1821 to 1844 having been respectively 20.9 per 1,000 when marching, and 8.5 per 1,000 when in cantonments.

But, while at all times more liable to be attacked when marching than when in cantonments, it has broken out among troops performing long journeys, more frequently than when the marches were short; and as the journeys have been more and more prolonged, whether as to time or distance, the outbreaks have become more frequent and the proportion of the troops attacked greater; and similar consequences are observed to result from increasing the assemblage of human beings; for the liability of the camp to be attacked, and the proportion of the troops attacked, have increased with the numbers assembled together. These circumstances, all of which tend to exhaust the frame and add to the hardships

of the soldiers seem to have made them thereby more subject to this disease and more liable to its attacks.

The Madras native soldiers have been more frequently attacked and have lost a much greater proportion of their strength when marching through districts where cholera was prevalent, than when the villages they were passing were free from the disease. The greater loss they then sustained, seems to have arisen from the circumstance that when the marching corps were attacked with cholera when it was prevalent in the districts the outbreaks almost always occurred in an epidemic form, while if it appeared when not prevalent in the villages it was in general only in sporadic cases.

When we examine the different classes of which these bodies of men consist, habits of life, age, sex, and rank are found to exercise a great influence on the liability to be attacked and on the intensity of the disease. The admissions and deaths amongst H. M. regiments serving in the madras presidency, have been in these different classes as follows ;

TABLE XXXIV.

	Officers.	Rank and File.	Women.	Children.
Proportion of sick to strength, 1 in every...	110	71	60	90
Proportion of deaths to admissions, 1 in every..	2·3	2·9	2·8	2·0

Officers have been least attacked, but excepting the children, they have lost the greatest number of sick.

It is also observed that soldiers of irregular and dissipated habits, have been oftener attacked than their well-conducted comrades, and fewer of them have recovered from their illness, the numbers of the two classes attacked having been 25· and 20· per cent. and the proportion of deaths to sick one in every 4·5 and one in every 6·3 respectively.

It will be observed also, from table XIV, that the older soldiers have been less frequently attacked than the younger men, but that fewer of them have recovered; and it is only in accordance with what has been observed in other diseases, and in accordance with the natural laws, to observe that early treatment is of great consequence in combating with this pestilence; that the susceptibility of individuals to be attacked is greatly modified by their personal habits; and that soldiers in the prime of life possess greater powers of rallying from sickness than their older comrades. But when the returns from bodies of men are examined, although the extent of the outbreak is observed to be very greatly modified by the physical circumstances affecting the troops, yet the proportion of the sick that recover, but very slightly varies, however different the position of the troops may be.

In the 24 years from 1821 to 1844, 8·5 per 1,000 of the Madras native soldiers were annually attacked with cholera, when they were living in cantonments, but 20·9 per 1,000 of the troops on the line of march: there was in either case however but little difference in the intensity of the disease, the proportion of deaths to sick being one death in every 2·6 and one in every 2·4 respectively. When marching through villages infected with cholera 117· per 1,000 of the strength were attacked, when the outbreak occurred in an epidemic form, and 14· per 1,000 when sporadic, but the proportion of deaths among the sick was one in every 2·4 and 2·6 respectively.

When cholera occurred while not prevalent in the villages through which the troops were marching, 65· per 1,000 of their strength were attacked when the outbreak was epidemic, and 7· per 1,000 when sporadic, but the proportion that died, of those attacked, was one in every 2·4 and 2·5 respectively; and amongst troops attacked on the march when the other physical circumstances were not detailed, 70· per 1,000 of their strength were admitted, when the attacks were epidemic

and 13· per 1,000 when sporadic, but the proportion of deaths to admissions was in each case nearly the same, being one death in every 2·4 and 2·3 respectively: but the proportion of deaths to admissions has not materially varied wherever the disease has broken out, whether in cantonments in the H. E. I. Co.'s territories, from one to three thousand miles apart, or occurring in Birmah, Ceylon, in the Peninsula of India, in Great Britain, Gibraltar, in Canada or in the United States of America, the last distant half the circumference of the globe from the place it originally appeared; the proportion that died of those who were attacked having been 1 in every 4·0 at Moulmein; 1 in every 3·0 in Ceylon; 1 in every 3·3 in the Madras Pesidency; 1 in every 3·0 in Great Britain; 1 in every 3·4 at Gibraltar; 1 in every 2·8 in Canada, and 1 in every 3·5 in the army of the United States. We cannot help being struck with this constant rate of mortality which has occurred among the sick under the most varied circumstances, and in all countries, and there is a natural anxiety excited to ascertain if any advantages have resulted from the measures adopted for its prevention or cure. Dr. Lorimer in his report has shown that when cholera has broken out amongst native soldiers when marching "of all the measures adopted to check its progress the smallest proportion of the strength was attacked when the route was changed." Of the five regiments that adopted this plan, only 51· per 1,000 of their strength was attacked with the disease, while 94· per 1,000 were attacked of the strength of the three regiments that broke up into wings, 95 per 1,000 among the regiments that halted; 99 per 1,000 in the 79 instances that regiments marched on and took no precautions, and 116 per 1,000 in the 25 regiments that continued their journey in short easy marches. The troops with whom the last measure was adopted suffered most of all, a result which might have been anticipated as they were continued within the range of the exciting cause of the disease and subjected to the usual

fatigues of marching; while those who by a change of route got beyond the influence of the morbific cause, suffered only half the loss of the others.

It is not however on the line of march, alone, that change to another place has been found of use, for it has been often resorted to with troops in cantonments, as well for this as for other diseases that take on an epidemic character, and with great immediate advantages. The advantage to be hoped for from abandoning the locality where a virulent epidemic appears, is derived from our acquaintance with the fact which has been demonstrated in table XXX that when the agent which gives rise to disease shows itself in the epidemic form, its influence is frequently so confined as to afford a fair prospect of securing the troops from its ravages by removal to a short distance from the locality where it originated. It is in fact a peculiar feature of cholera and yellow fever, and of epidemic diseases generally, that they occur for a period of years in one station or in an island, while other places a few miles distant remain altogether exempt, and the knowledge of this fact has often been employed to place troops beyond the influence of the morbific agent.

It may be quoted as instances of the benefit that has resulted from quitting the locality, that in 1828 when remittent fever cut off upwards of a tenth of the white troops in the garrison of Grenada, it made its first appearance about the middle of August and continued to range with great violence till the end of November. It was principally confined to the royal artillery quartered at Fort St. George. On their being moved to Richmond Hill it disappeared; but soon after broke out again among a party of the 27th foot stationed there and continued, though with less virulence, till the month of April.*

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* Report on the Windward and Leeward command, p. 23.

Another instance of the advantage of abandoning a locality occurred while the epidemic of cholera raged in Halifax in 1834. The rifle brigade suffered most, indeed to such an extent that 18 deaths took place between the 21st and 25th of August. The corps was in consequence sent to Sackville, 8 miles from Halifax, after which only four new cases occurred. "The success of this experiment led to the the same measure being adopted with the 96th and 83rd regiments, who were removed to an encampment in the vicinity of the town with like good effect.* H. M. Ship 'President' was at that time (August) lying in the harbour, and four days after the appearance of cholera among her crew she was moved from her original moorings near the dockyard to a point three miles distant in the harbour, and after the change of place no case of the disease occurred."† Another instance of benefit derived from quitting the place where an epidemic rages, was observed when cholera occurred at Montreal in 1832. "It appeared among the troops two days after it had broken out in the town, and out of a force which did not exceed 550 men, 39 were cut off in a few days. With the view of arresting the alarming progress of this pestilence the military at Montreal, were about the 20th June removed to an encampment on the island of St. Helens and all communication with the town cut off. They remained there till the end of October, during which only one case occurred among them. A detachment of 70 men, however, who had been removed to the barrack of La prairie on the opposite side of the river suffered extremely, for of 10 soldiers attacked 8 died, the remainder were then transferred to St. Helens, after which no fatal case, and only two or three slight attacks occurred among them." Report 1839 p. 30.

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* Colonel Tulloch's reports, Nova Scotia and New Brunswick, p. 186.

† Report on British Navy, p. 105 of report on West Indies.

Equally advantageous results followed the adoption of this plan when cholera occurred at Colombo in 1834, "as the 97th regiment was suffering most two companies of that corps were on the 2nd of April marched to an encampment at Mahara, about eight miles on the road to Kandy, and another to Mount Lavinia a rocky promontory jutting into the sea nearly seven miles on the road to Galle. As no benefit was derived from the change to Mahara, while those at Mount Lavinia were entirely free from the disease, the two companies were moved there from the former station three days afterwards, as well as another company which had been sent, but without any beneficial effect, to an encampment on the sea beach about three miles from Colombo. After the four companies were thus concentrated at Mount Lavinia, very few cases occurred and only one or two deaths, the cases in the fort also became less numerous and less severe, as more ample space was afforded to those that remained, (the barracks had previously been overcrowded) and by the middle of April there was an entire cessation of disease, though it reappeared to a slight extent after the return of the troops."—Report 1841, p. 21.

On each occasion that the yellow fever has occurred at Gibraltar, the plan of removing the troops from the fort has been attended with the fullest success. When it broke out among the inhabitants and the garrison in 1804, half the civilians were cut off "but from the troops being encamped on the neutral grounds, soon after the disease disappeared, they lost only a fourth part of their number." In the end of October 1810, a similar disease appeared, but it was confined to the soldiers of one regiment of whom only six died, and it ceased on the corps being encamped on the neutral ground. "In the year 1813 and 1828, the disease again recurred, but completely ceased among those troops removed to the neutral ground, though on each occasion it continued its ravages

among the population of the city. In the last of these periods, 1828, when it appeared on the 5th of September, among the sappers and miners and 12th regiment of foot, the men of the latter corps were immediately encamped on the neutral ground, from which period till the end of the month, when they were obliged to resume their duties in the town, no new cases occurred among them."—Colonel Tulloch's report on Gibraltar 1839, p. 8 a.

In 1828 "a removal even to a very small distance from the town seems to have secured a complete immunity from the epidemic, for it is stated by the surgeon of the 12th regiment, that of 92 women and 190 children encamped on the neutral ground, during the whole period it prevailed, not one was attacked though in constant communication with the soldiers of the corps who went daily from that encampment to do duty in the town, and of whom many were attacked with the disease on their return. It is also remarked, that on the neutral ground the epidemic never made its appearance to any extent, though from 6,000 to 8,000 of the inhabitants were encamped there, yet that spot is composed of materials which are supposed highly favourable to the formation of malaria." Report, 1839 p. 10.

"Similar benefits were derived by removing from the barracks, when remittent fever broke out in an epidemic form at Kingston in 1827. The 84th regiment had arrived in February of that year, and enjoyed such a remarkable degree of health, that only one death took place in the whole corps in six months; but in July, fever began to show itself among them without any cause to induce it, except that the barracks were rather crowded at that time. In the hope of checking its progress by better accommodation, a part of the corps was sent to Up Park Camp, and this change at first seemed to have a good effect, but towards the middle of August, sickness rapidly increased, and numbers daily became its victims. The

fort was then evacuated, and the troops moved to an encampment at Airey Castle, a few miles off, which had some effect in checking the disease; but unfortunately, wet boisterous weather set in, the tents were blown down and the sick being exposed for several hours to its influence, twenty of them perished in one night; temporary huts were afterwards erected and so soon as the troops were comfortably accommodated in them, the disease disappeared. During the short time it continued at its height it proved more rapidly fatal than on any previous occasion, 112 having been cut off out of about 300, in the short space of one month."—Report 1838, p. 56. Jamaica Command.

I have quoted instances enough to show the practical application of the facts described in Table XXX, and the efficacy of moving from a locality on the occurrence of an epidemic, to induce a trial of it being made when cholera occurs in that manner. Fear scattering a terrified community first perhaps, pointed out this plan of escaping disease, and the benefit that often follows its adoption is so well known to some of the nations of India that they have recourse to it when cholera breaks out, and the mortality in their villages rises high. Though it is true that the change often fails to diminish the frequency of the attacks, it likewise often succeeds, and it deserves to be carried out as it is the best means with which we are acquainted to save the lives of men. A disease which when appearing in scattered cases, may be but of little consequence, often occasions a frightful loss when occurring epidemically, and any plan by which we might escape from its attacks should be eagerly grasped at. "Remittent fever in Jamaica does not appear to be more severe in its character, than when it occurs in the Windward and Leeward command, the proportion of deaths to recoveries being in both 1 in 8 on the average of the whole 20 years. Jamaica is, however, much more subject to this disease, in an epidemic form, than the other West India stations, and on such occasions it is often

of an extremely fatal description scarcely yielding to any mode of treatment. These epidemics principally prevailed in 1819, 1822, 1825 and 1827, and at some stations and in some corps raged with such severity, that nearly one half died of those attacked. They appear without any warning and often suddenly at periods when the troops have for some time previous enjoyed a comparative immunity from disease ; these epidemics spared neither age, sex nor condition of life, the temperate and the intemperate, the prudent and the thoughtless, fell victims to them in nearly an equal degree ; and all sanitary precautions save the immediate removal of the troops from the locality where they originated, seem to have had little or no effect in arresting their progress."—Report 1838, p. 46.

When the change is not followed by success it is doubtful whether the failure be owing to the agent that gives rise to the epidemic being so generally diffused that no neighbouring ground can be taken up free from its influence, or whether it be that the men having once been exposed to the morbific cause, the continuance of the disease is only the slow development of its action, though the former is probably the true reason. There are instances where corps on the line of march have been attacked by cholera, and carried it along with them for weeks and even months through districts enjoying a perfect freedom from the dreaded scourge, and a healthy regiment will pass another on the march at the time they are daily losing numbers of their men and followers, and will be halted for many succeeding days on the ground, dotted over with the newly disturbed earth, where the corps which had just vacated it had buried their dead, and, though moving in the same route the sickly corps had just come over, the healthy regiment continues its journey free from its attacks ; while instances have occurred of ships being attacked with cholera on the open ocean and others of ships quitting harbour where they had been attacked with cholera and car-

rying the disease along with them for many days,—these and similar facts make the laws that regulate the epidemic diseases inexplicable, and they will probably long continue obscure, but in the meantime, it cannot be too generally known that the agent which gives rise to them is often confined to a very narrow spot, and though the epidemic may long continue in all the severity of its first outbreak in the locality where it originally appeared, a march of a few miles in any direction will often place the suffering troops on ground beyond the range of its influence where they may encamp in security till the epidemic influence disappear and permit their return to cantonments. When it is remembered that little can be done by the best remedial measures, to diminish the mortality amongst the sick, the suggestion here made, to change the route when marching, and to abandon the locality when the troops are in cantonments, on cholera appearing as an epidemic, must be regarded as of very great importance. That medical treatment is of undoubted benefit even in this rapid and virulent disease, was shown (at pages 24 and 25); the deaths among the native soldiers attacked with cholera who sought advice within four hours and a half of their being seized was only 32·4 per cent., while 57·7 per cent. of the sick died, who delayed upwards of five hours; 32 per cent. of the admissions having died who came to hospital sooner than the average time; 52. per cent died of the sick who came at the average time, and 57. per cent. who delayed longer than the average time. While this fact should cause us to exert our best efforts to induce the soldiers to seek treatment early, there is yet a great mortality amongst the sick under the most favourable circumstances, and preventive measures must still claim the greatest importance. A few lives may possibly be saved by attention to the sick, but our hopes of doing extensive good must rest on the success of measures of prevention, and the best of these measures recommend themselves as the result of the following deductions.

1st. One race of men is more susceptible of the influence of the cholera agent than another: the european soldiers, for instance, are much more frequently attacked with it than their native comrades, and the Madras native troops have lost more of their strength than the native soldiers either of Bengal or Bombay.

This knowledge may be advantageously applied in the selection of a site for locating troops, it being evident that this greater susceptibility of the europeans inculcates the necessity of ascertaining if cholera ever occur among the native troops or resident population in the village or district to be selected, for it may, certainly, be assumed that in places where the latter are at all attacked with it, europeans would suffer still more, and though occurring only in sporadic cases amongst the natives, it would probably appear among the more susceptible europeans as a virulent epidemic.

It is likewise evident in choosing a site, that, even though there may be no cholera amongst the slightly susceptible native inhabitants, their being wholly exempt from the disease is no proof that our european soldiers would enjoy a like immunity.

The knowledge of the above fact may also be advantageously employed in distributing troops, as cantonments where cholera frequently occurs might be safely occupied by a class of troops not susceptible of its influence, stations for instance where europeans would be nearly annihilated might be held by the native soldiers with comparative immunity.

This law may also explain the reason why some native infantry regiments have never in all their marches been attacked with cholera, also why, of two regiments marching or encamped together, the one is attacked with cholera and the other not; and it may also explain the circumstance of cholera breaking out in an epidemic form in a regiment

marching through a district free from the disease, it being possible that the agent is diffused through the district, but exerts no influence on the native inhabitants, whilst the marching regiment, from its greater susceptibility, whether owing to difference of race or rendered so by the fatigues &c. of marching, is attacked with it.

2d. There are great difference in the rates of mortality from cholera amongst soldiers in adjoining cantonments, and this difference, indeed, is equally observable amongst the troops of the same cantonments although their barracks or lines be not more than a few hundred yards apart.

This knowledge could be readily applied to locate troops during cholera seasons, as the soldiers could be readily removed to a neighbouring station where the troops are rarely attacked. The rate of admissions from cholera in Fort St. George, for instance, has been 28· per 1,000 annually, while, only 13 miles distant in Poonamallee and ten miles distant at St. Thomas' Mount, the annual admissions have been but 13· and 4· per 1,000 respectively.

3d. When cholera occurs any year, in an epidemic form, the mortality of that year is raised above the average of the period, as well because of the deaths it occasions, as by the occurrence of numerous casualties from other severe diseases that break out in these cholera years. These complaints are fevers, liver disease, dysentery and diarrhœa; and this is particularly marked with respect to fevers, for in divisions where there is much cholera, there is also much fever, and vice versa. The number of "admissions generally" are, however, fewer in cholera years than in other years, which is the consequence of a diminution in the number of admissions by those diseases which rarely terminate in death. In other words fewer cases of illness come into hospital in these cholera years, but the few that are admitted are of a severe class.

These severe diseases occur as the forerunners of cholera, or break out along with it, though sometimes too, they appear subsequently to its outbreak.

Therefore in stations liable to be ravaged by cholera, any unusual prevalence of fevers, liver disease, dysentery or diarrhœa, should excite suspicions that cholera is about to appear, and precautions should be taken accordingly.

4th. Cholera seems to have, in most stations, its periods of appearance, and at such periods all predisposing causes should be sedulously avoided. It will have been also observed that a greater proportion of the strength was admitted by cholera in the first half of the year, than in the second; but, in the second half of the year, the disease had more intensity, fewer of the sick, then, recovering.

5th. The different branches of the Madras native army are attacked in different proportions, the sappers having suffered least, the cavalry next, then the infantry, and the artillery most; but there is, as yet, nothing to show whether these differences be owing to difference of race, or to the physical circumstances affecting these branches of the service being different.

6th. The epidemics that have occurred among the Madras native army when marching, have lasted from a few days to three months; but in 106 out of 121 regiments the disease disappeared within 40 days from the date of its outbreak.

7th. An epidemic has the three stages of accession, virulence and decline, and from an examination of twenty of the more severe epidemic attacks, it would appear that the stage of accession continues till the 4th or 5th day, then the virulent stage commences and lasts until the 14th day, and the disease declines to the end. In the period of virulence one patient died in every 2·2 admissions, and only one died in every 2·7 admissions during the stages of accession and decline. See Table 28 and 29.

8th. European soldiers are now more seldom attacked with cholera than in former years, but of those attacked fewer now recover than formerly.

Native soldiers are attacked in the same numbers and also lose the same proportion of their strength as formerly. But native soldiers though less frequently attacked than europeans, lose a greater proportion of those attacked. This seems to be owing to the law that when cases of disease occur amongst a people not generally liable to its attacks, it then seizes those who from some peculiar idiosyncracy are unusually predisposed to it, a class amongst whom the mortality is always very great. Thus the ratio of the strength of european soldiers attacked with cholera is less, now, than in former years but, of those attacked, fewer now recover; so the native soldiers are less frequently seized with it than the europeans, but comparatively fewer of the native sick recover.

9th. The younger soldiers and men at the average age of a regiment recover in greater numbers than the older men.

10th. The proportion attacked, and the rate of mortality is greatly modified by the age, sex and rank of life: thus the women of a regiment are the most susceptible of this disease, then the men, then the children, and the officers are least attacked of all; but the mortality amongst the sick is greatest amongst the children, then the officers, then the women, and the men last. The results detailed above (in 5, 6, 7, 8, 9, and 10,) are not, perhaps, in the present state of our knowledge regarding this disease, capable of any practicable application, but I have arranged them here, as they will doubtless with our increasing knowledge be turned to some advantage.

11th. Drunkards are more frequently attacked, and when sick die in greater proportion than sober men.

12th. Treatment, and particularly early treatment, is effi-

cacious in cholera. This is proved by the greater rate at which the sick recovered who came under treatment early, compared with the rate among those who sought relief late in the disease.

All should therefore be enjoined to apply for remedies early in the disease, when treatment is peculiarly efficacious.

13th. Native soldiers are more liable to be attacked when marching than when in cantonments, for which reasons, they should be kept as long as possible in cantonments and should not be much marched about, particularly in years and seasons when cholera is assuming an epidemic form.

14th. When compelled to move troops, the reliefs should be so arranged as to preclude the necessity of marching to remote cantonments, for the liability to be attacked and the rate per 1000 attacked, increases as the journey is prolonged whether as to time or distance, and every effort should therefore be made to shorten the time occupied on the journey.

15. A regiment should be broken up into smaller bodies, and every effort made to reduce the number of people collected together, as it has been shown that the liability to be attacked, and the rate of attacks increase as the numbers congregated together increase.

16th. In doing this it might be advisable to march the regiment by wings and to allow the families to travel by themselves either by sending them on in advance or better still, allowing them to follow about a month afterwards, in the rear. Though the european soldiers in Bengal are more frequently attacked by cholera than their comrades either in Madras or Bombay, the native soldiers of the Bengal presidency lose less of their strength than the native soldiers of the other presidencies, a circumstance which may, in part, result from their never keeping their families along with them.

17th. When troops are marching to another station all

measures tending to exhaust their strength or add to their fatigue should be carefully guarded against.

a. They should be allowed to march without knapsacks.

b. The stages should be short, should not exceed eight or ten miles, which would admit of the troops sleeping until four in the morning, (for with a ten mile march, they need not move till day break,) and the long sleep and short stage would prevent that exhaustion which seems so powerful a predisposing cause of an attack.

c. The march should be prosecuted day after day, by which the troops would accomplish 300 miles per month, a rapidity which is seldom if ever attainable when the journey is performed by making long stages and bi-weekly halts.

d. The advance of pay for the native soldiers of the Madras presidency, who are a far less provident race than either their Bengal or Bombay comrades, should be retained in the regimental cash chest, to be issued at intervals during the journey, and thus ensure their always having the means of purchasing wholesome food.

18. The route should never be laid through districts or villages where cholera is prevalent, and the ordering of the route should be left to the divisional authorities who could readily ascertain the health of the country.

19. Commanding officers should be allowed discretionary powers, and, indeed, should be enjoined to alter the route, if necessary, to avoid infected villages. Whether cholera be or be not contagious, or whether it arise from some morbific agent diffused through the air, the importance of the last two suggestions is in no way diminished, as it has been shown (in Table XVII) that 117 per 1,000 of the strength were attacked when cholera broke out in an epidemic form in regiments moving through infected districts, and only 65 per 1,000 when it occurred as in epidemic while marching in districts

free from the disease. To ascertain and avoid infected villages should be pointed out to officers as an indispensable part of their duties.

20. Commanding officers should, likewise, be enjoined to change their route, and strike off to a district free from cholera, should the disease appear in an epidemic form, it having been shown that of all the measures adopted to check its progress the smallest proportion of the strength was attacked, when the route was changed.

21. As we do not know the cause of cholera (and if we did, it might be quite impossible to avoid its very subtle agency) regiments when marching should never encamp on ground remote from habitations, but should always pitch near some village free from the disease. During the prevalence of cholera, officers on arriving at a place, not unfrequently encamp on uncultivated fields at a distance from the town or village, but it is evident that until we discover the cause of cholera it is not safe to encamp on waste ground where no means exist to prove whether the cholera agent be present or not.

22. When cholera is prevalent in a cantonment all exhausting parades or other fatiguing duties should be suspended and the troops cautioned to husband their strength, particularly enjoining strict sobriety.

23. If attacked in cantonment in a virulent epidemic form, the locality should be abandoned, for one in the neighbourhood free from the disease. But where the change of place is tried and cholera does not cease, it is probably, owing to the agent being every where diffused.

24. And, lastly, it has been shown that this disease has been attacking fewer and fewer europeans, every year since it first appeared ; and that this decrease cannot be owing to any diminution in the supply of the morbid agent, as the

native soldiers are now as numerously attacked as ever, and as the disease also retains with them the same intensity, although its intensity, amongst the european soldiers has been annually increasing, it is thereby proved that the europeans are now less frequently attacked only because, from the great improvements that have been introduced in their diet, clothing and accommodation, they are less exposed, than formerly, to the action of the noxious agent, and this fact should induce us to make further improvements in their condition.

Moreover under whatever circumstances of comfort or privation, whether appearing in an epidemic or sporadic form; whether attacking troops in cantonments or on the march; whether in assembled multitudes or in small bodies; in all seasons; in all climates; and in countries remote or apart; the numbers seized have varied greatly, but the intensity of the disease has been nearly the same; having usually been one death in every 3 admissions amongst the europeans, and, amongst the native soldiers, one death in every 2 admitted. It is, likewise true, that the frequency of attacks have of late years diminished, but the mortality is still very great; and preventing an attack of cholera is therefore the great object to be attended to, for in preventing three cases amongst europeans and two cases among natives we prevent one death, a sufficient recompense to those who strive to ward off an attack of this disease.

FINIS.

APPENDIX.

No. 171.

To J. F. THOMAS, Esq., Chief Secretary to Government.

SIR,—Under instructions from the Medical Board, I have the honor to forward for submission to the Right Honorable the Governor in Council the accompanying review of several works on Cholera and compilation of statements relative thereto, drawn up by Assistant Surgeon E. G. Balfour of this establishment, and to state that in the opinion of the Board the performance is highly creditable, and testifies to the ability and zeal of that officer; it is a paper in every point of view well worthy of publication.

(Signed) A. LORIMER.

9th August, 1849.

No. 3055.

Military Department, Extract from the Minutes of Consultation,

21*st August* 1849.

Read the following Paper.

From the Secretary to the Medical Board.

Here enter 9*th August* 1849, No. 171.

The Right Honorable the Governor in Council in accordance with the recommendation of the Medical Board, grants authority for printing the work by Assistant Surgeon Balfour submitted with the foregoing letter.

2. The Governor in Council is of opinion that it should be in the form of a Pamphlet for general circulation. The number of copies to be determined by the Medical Board in communication with Mr. Balfour, under whose superintendence the work should be carried through the press.

4. The Right Hon'ble the Governor in Council notices the favorable testimony borne by the Medical Board to Assistant Surgeon Balfour's ability and zeal.

(Signed) C. A. BROWNE, Lt. Col.
Secretary to Government.

From Assistant Surgeon EDWARD BALFOUR,
The Right Hon'ble the Governor's Body Guard.

To the SUPERINTENDING SURGEON, Presidency.

Sir,—I have the honor to bring to your notice that there is an impression on the minds of many of the natives of this country as well as amongst many of ourselves, that though cholera has been occurring for the past 32 years, there are still some places where it has never appeared, although the villages and hamlets in their immediate neighbourhood have suffered on almost every occasion that the pestilence raged; and I think that before the present generation pass away it would be an interesting, and, might be, a highly important matter to ascertain the number of these "refuge" villages, in order that the localities might be examined to observe if the soil, or rocks, or atmosphere around them differ in any respects from those of the neighbourhood where no such immunity has existed.

Collectors and Commissioners could readily obtain from the villages all the requisite information, without incurring any expense, and I solicit the favor of this letter being submitted through the Medical Board to Government in the hope that the Board may recommend that returns may be called for in the annexed form.

(Signed) EDWARD BALFOUR, *Asst. Surg.*
The Right Hon'ble the Governor's Body Guard.

Madras, 28*th February*, 1849.

(Signed) F. GODFREY, *Superintending Surgeon.*

Form of Return showing the names of Villages which have never been attacked with cholera.

Names of Villages.	Name of the Talook and Zillah in which the village is situated.	Number of houses in the village.	Number of inhabitants in the village.	Have troops ever marched thro' this village.	Distance and name of nearest village where cholera has occurred.